

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF DELAWARE

|                           |   |                             |
|---------------------------|---|-----------------------------|
| VOITH PAPER GMBH & CO. KG | : |                             |
|                           | : | Civil Action No. 07-226-JJF |
| Plaintiff,                | : |                             |
|                           | : |                             |
| v.                        | : |                             |
|                           | : |                             |
| JOHNSONFOILS, INC.        | : |                             |
|                           | : |                             |
| Defendant.                | : |                             |

**DEFENDANT JOHNSONFOILS, INC.'S  
OPENING CLAIM CONSTRUCTION BRIEF**

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### NATURE AND STAGE OF THE PROCEEDINGS

On April 27, 2007, Voith Paper GmbH & Co. KG (“Voith”) filed this action alleging that JohnsonFoils, Inc. (“JohnsonFoils”) infringed on Patent No. 5,718,805 (“the ’805 Patent”), and Patent No. 5,972,168 (“the ’168 Patent”) (collectively referred to as “Patents-in-Suit”). JohnsonFoils served its Answer, Affirmative Defenses and Counterclaims on August 13, 2007.

On August 3, 2007, the Court issued a Scheduling Order setting the trial for November 5, 2008, and ordering the parties to:

- (1) File all motions to amend the pleadings by December 21, 2007;
- (2) File their respective Markman Briefs ten days prior to the scheduled Markman hearing;
- (3) Attend a Markman hearing scheduled for January 30, 2008;
- (4) Complete exchange of contentions interrogatories, identify witnesses and complete document discovery by February 15, 2008; and
- (5) and complete fact discovery by April 30, 2008. (D.I. 17).

On August 24, 2007, JohnsonFoils filed Requests for Reexamination with the United States Patent and Trademark Office for the Patents-in-Suit.

On August 28, 2007, JohnsonFoils filed a “Motion to Stay the Proceedings Pending Reexamination of the Patents-in-Suit or in the Alternative for Leave to File a Motion for Summary Judgment Prior to August 20, 2008 that Patents 5,718,805 and 5,972,168 are Invalid.” (D.I. 27). Voith filed its response on September 17, 2007. (D.I. 33). JohnsonFoils’ motion to stay remains pending.

On September 5, 2007, Voith answered JohnsonFoils' Counterclaims. (D.I. 31).

On November 9, 2007, Voith filed its "Motion to Compel Defendant JohnsonFoils, Inc., to Provide Information Requested in Voith's First and Second Sets of Interrogatories and To Produce Documents Responsive to Voith's First and Second Set of Requests for Documents." (D.I. 42). JohnsonFoils filed its "Answering Brief to Plaintiff's Motion to Compel Defendant JohnsonFoils, Inc. to Provide Information Requested in Voith's First and Second Sets of Interrogatories and to Produce Documents Responsive to Voith's First and Second Requests for Documents" on November 28, 2007. (D.I. 46). Voith then filed a further Reply Brief on December 3, 2007. (D.I. 48). Voith's motion to compel remains pending.

On December 17, 2007, JohnsonFoils filed "Defendant's Motion to Compel Production of Documents in Response to Its First Set of Document Requests." (D.I. 49).

On December 18, 2007, Voith filed its "Motion for a Protective Order Pursuant to Federal Rule of Civil Procedure 26(c) Prohibiting the Disclosure of Voith's Highly Confidential Information to Individuals Engaged in Competitive Business Practices for or on Behalf of Voith's Competitor JohnsonFoils, Inc." (D.I. 52).

On December 21, 2007, JohnsonFoils filed its "Motion for Leave to Amend Its Counterclaims" (D.I. 54) and its "Opening Brief in Support of Its Motion for Leave to Amend Its Counterclaims." (D.I. 55).

On January 9, 2008, JohnsonFoils' filed its "Answering Brief in Opposition to Plaintiff's Motion for A Protective Order Pursuant to Federal Rules of Civil Procedure 26(c) Prohibiting the Disclosure of Voith's Highly Confidential Information to Individuals Engaged in Competitive Business Practices for or on Behalf of Voith's Competitor JohnsonFoils, Inc." (D.I. 57).

On January 14, 2008, Voith filed its "Answering Brief in Opposition to Defendant JohnsonFoils, Inc.'s Motion for Leave to Amend its Counterclaims." (D.I. 62).

On January 16, 2007, JohnsonFoils filed its "Declaration of Patricia P. McGonigle in Support of Defendant, JohnsonFoils, Inc.'s Opening Claim Construction Brief." (D.I. ).

### **SUMMARY OF ARGUMENT**

Each apparatus claim in Patent Nos. 5,718,805 and 5,972,168 recites three structurally distinct sections with different components. Each method claim of Patent 5,972,168 is directed to producing paper web by feeding wire belts past those structurally distinct sections, which have distinct functions. Since different claim limitations separately reciting structurally and functionally distinct elements can not mean the same thing, <sup>1</sup> the first, second, and third sections of the Patents-in-Suit must be construed as separate sections that do not overlap.

### **STATEMENT OF FACTS**

The '805 Patent, Exhibit A, issued from a chain of continuing applications. The '805 Patent issued directly from Application No. 08/556,769 ("the '769

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<sup>1</sup> See, *Applied Med. Res. Corp. v. United States Surgical Corp.*, 448 F.3d 1324, 1333 (Fed. Cir. 2006).

Application”) which was filed November 2, 1995 as a continuation application of Application No. 08/286,948 (“the ’948 Application”), filed August 8, 1994. *Id.* The ’948 Application, which issued as Patent No. 5,500,091 (“the ’091 Patent”), was a continuation of Application No. 08/055,918 (“the ’918 Application”), filed April 29, 1993 and which ultimately issued as Patent No. 5,389,206 (“the ’206 Patent”). *Id.* The ’918 Application was a continuation of Application No. 07/773,965 (“the ’965 Application”) filed as PCT/EP90/01313 on September 8, 1990. *Id.* The ’805 Patent also claims priority to DE 39 27 597.3, filed August 22, 1989. Exhibit A, Facepage. The ’805 Patent includes independent apparatus claims 1 – 5 and no dependent claims. Exhibit A, Col. 8, line 4 – Col. 12, line 21.

The ’168 Patent also issued from a chain of continuing applications, as follows. The ’168 Patent issued directly from Application 09/161,138 (“the ’138 Application”) which was filed on September 25, 1998 as a continuation of Application No. 09/023,435 (“the ’435 Application”). *Id.* The ’435 Application was filed on February 13, 1998 as a continuation of the ’769 Application, *i.e.* the ’805 Patent application. *Id.* Like the ’769 Application, the ’138 Application is also a continuation of the ’948 Application, the ’918 Application, the ’965 Application, PCT/EP90/01313, and DE 39 27 597.3. *Id.* The ’168 Patent includes independent apparatus claims 3 and 7; and independent method claims 1 and 5. Exhibit B, Col. 8, line 4 – Col. 12, line 2. The ’168 Patent also includes dependent claims 2, 4, 6, and 8.

JohnsonFoils produced the official United States Patent and Trademark Office (“USPTO”) file histories related to the Patents-in-Suit in discovery as JFI0204346 – JFI0204886. On even date with the filing of this brief, JohnsonFoils filed the “Declaration of Patricia P. McGonigle in Support of Defendant, JohnsonFoils, Inc.’s Opening Claim Construction Brief.” (“Declaration”). The Declaration included those file histories as its Exhibits 1 through 5. Exhibits F, G, H, and P herein are copies of selected documents of Exhibit 3 of the Declaration. Exhibits I, K, M, N, and O herein are copies of selected documents of Exhibit 1 of the Declaration.

## **ARGUMENT**

### **I. INTRODUCTION**

Each of the Patents-in-Suit states: “The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from fiber suspension.” Exhibit A, Col. 1, lines 15 – 27; Exhibit B, Col. 1, lines 17 – 19. In other words, the Patents-in-Suit relate to a paper making machine and a method of making paper with that machine. The claimed machine and process of making paper involves draining water from a fiber suspension by running the fiber suspension serially past unique components of the paper machine. Exhibit A, Col. 1, lines 15 – 44; Exhibit B, Col. 1, lines 17 – 46.

Each apparatus claim in the Patents-in-Suit recites that the machine has a twin wire zone separated into discrete “first”, “second”, and “third” sections and each section includes unique components. See Exhibit A, Col. 8, line 4 – Col. 12,

line 21; and Exhibit B, Col. 8, line 4 – Col. 12, line 2. Each method claim recites “feeding the wire belts” first past components that correspond to the first section, then past components that correspond to the second section, and finally past components that correspond to the third section. See Exhibit B, Col. 8, line 4 – Col. 12, line 2. The scope of each claim of the Patents-in-Suit is limited to either a machine with these three discrete sections or a method of making paper web with such a three section machine.

Exhibit C includes a claim chart comparing the '805 Patent claim 1 to its claims 2 – 5. Exhibit D includes a claim chart comparing the '168 Patent independent claims to one another and to the '805 Patent claim 1.

## II. LEGAL STANDARDS

### A. Claim construction.

Claim construction is a matter of law decided exclusively by the court and not the finder of fact. *Markman v. Westview Instruments*, 517 U.S. 370, 372 (1996) (“Markman II”). Construing the claims is a multi-step process of: 1) identifying the person of ordinary skill in the art; 2) looking at the plain and ordinary meaning of the claims; 3) looking to the patent’s specification and prosecution history if there is a contrary or special definition for a term; 4) looking at extrinsic evidence to interpret the terms; and 5) construing the terms based on the previous steps. See *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995) (“*Markman I*”), *aff’d*, 517 U.S. 370 (1996).

**1. Identify the person of ordinary skill in the art.**

A person of ordinary skill in the art is one who thinks along the line of conventional wisdom in the art and is not one who undertakes to innovate, whether by patient, and often expensive, systematic research or by extraordinary insights. *Life Techs., Inc. v. Clontech Lab., Inc.*, 224 F.3d 1320, 1325 (Fed. Cir. 2000) (citing *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985)).

**2. The Court must consider the plain and ordinary meaning of the claims.**

For every disputed claim term, a choice must be made between its plain and ordinary meaning or a contrary, if any, special definition from the specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005). The analysis begins with the claim terms themselves. “In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words.” *Id.* at 1314 (citing *Brown v. 3M*, 265 F.3d 1349, 1352 (Fed. Cir. 2001)). “[T]he context in which a term is used in the asserted claims can be highly instructive.” *Id.* In particular, the use of different terms in a claim connotes different meanings. *Applied*, 448 F.3d at 1333 (Fed. Cir. 2006) (citing, *CAE Screenplates, Inc. v. Heinrich Fiedler GmbH & Co. KG*, 224 F.3d 1308, 1317 (Fed. Cir. 2000)).

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding

structure, material, or acts described in the specification. 35 U.S.C. § 112, Paragraph 6. “[W]hether a claim limitation is in means-plus-function format, is a matter of claim construction and is thus a question of law reviewed *de novo*.” *Apex Inc. v. Raritan Computer, Inc.*, 325 F.3d 1364, 1373 (Fed. Cir. 2003) (citing *Kemco Sales, Inc. v. Control Papers Co.*, 208 F.3d 1352 (Fed. Cir. 2000)).

A claim limitation that uses the word “means” will invoke a rebuttable presumption that § 112, Paragraph 6 applies. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1369 (Fed. Cir. 2002). When a limitation lacks the term “means” but uses functional terms rather than structure or material to describe the claimed function, the limitation is in means-plus-function format. *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1257 (Fed. Cir. 1999) (citing *Al-Site Corp. v. VSI Int’l, Inc.*, 174 F.3d 1308, 1318 (Fed. Cir. 1999)).

In construing means-plus-function limitations, a court must first define the particular function claimed. *Sage Prods. v. Devon Indus.*, 126 F.3d 1420, 1428 (Fed. Cir. 1997). Then, the court must identify “the corresponding structure, material, or acts described in the specification” that performs the claimed function. 35 U.S.C. § 112, Paragraph 6; see *Sage Prods.*, 126 F.3d at 1428.

**3. The Court must consider the patent’s specification and prosecution history to determine if there is a contrary or special definition for a term.**

“The claims, of course, do not stand alone. Rather, they are part of a fully integrated written instrument ... . For that reason, claims ‘must be read in view of the specification, of which they are a part.’” *Phillips*, 415 F.3d at 1315. If the



specification reveals a special definition given to the claim term that differs from the ordinary meaning, then that term definition governs. *Id.* at 1316. Similarly, the prosecution history can be consulted to determine how the inventor understood the claim language and whether the inventor limited the invention during prosecution. *Id.* at 1317. In other words, the specification is the best source for interpreting a disputed claim, guided, as needed, by the prosecution history. *Id.* at 1315. Reliance on dictionaries or treatises to assist in interpreting the commonly understood meaning of the claim terms is to be limited, and the use of the term in the specification should be controlling. *Id.* at 1320-1324.

**4. As a last resort, the Court may consider extrinsic evidence to interpret the terms.**

As a last resort, extrinsic evidence, such as the prior art and expert testimony, may also be relied on to construe patent claims, but only after all of the intrinsic evidence is considered. *Markman I*, 52 F.3d at 980. Extrinsic evidence that contradicts the plain meaning of the claim terms should be rejected. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996).

**5. Once all of the above steps are completed, the Court can construe the claims.**

Having: 1) identified the person of ordinary skill in the art; 2) looked at the plain and ordinary meaning of the claims; 3) looked to the patent's specification and prosecution history to determine if there is a contrary or special definition for a term; and 4) considered whether extrinsic evidence is appropriate to interpret the terms, a court can construe the claims. *Phillips*, 415 F.3d at 1313-1314.

**B. The scope of a patent claim is subject to prosecution history estoppel or prosecution history disclaimer.**

Prosecution History Estoppel: Prosecution history estoppel prevents the patentee from broadening the scope of the claim through the doctrine of equivalents. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 734 (2002) (*Festo VIII*). By surrendering a broader claim, the applicant acknowledges the meaning of the words to describing the broader and narrower invention and affirmatively chooses the narrower meaning. *Id.* at 734-735. An applicant who narrowed the claims to obtain a patent cannot recapture the broader claim scope by arguing a lack of a broader word needed to describe the equivalent. *Id.*

“There are two distinct theories of prosecution history estoppel--amendment-based estoppel and argument-based estoppel.” *Deering Precision Instruments, L.L.C. v. Vector Distrib. Sys.*, 347 F.3d 1314, 1324-1325 (Fed. Cir. 2003). “In general, prosecution history estoppel, under either theory, requires that patent claims be interpreted in light of the proceedings before the PTO.” *Deering*, 347 F.3d at 1325. When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation. *Biovail Corp. Int'l v. Andrx Pharms., Inc.*, 239 F.3d 1297, 1301 (Fed. Cir. 2001).

With respect to amendment-based estoppel, a rebuttable presumption exists that a narrowing amendment related to patentability results in a surrender of a patent claim's scope. *Festo VIII*, 535 U.S. at 737. The Federal Circuit, on remand

from the Supreme Court, established three-steps for determining prosecution history estoppel. First, determine if the claim amendment narrowed the literal scope of the claim; second, determine if the narrowing amendment was made for a reason related to patentability; third, if the first and second steps are answered affirmatively, decide the extent of the scope surrendered by the amendment. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 344 F.3d 1359, 1366 - 1367 (Fed. Cir. 2003) (“*Festo IX*”). In *Festo VIII*, the Supreme Court imposed a presumption that a narrowing amendment relating to patentability surrendered all of the territory between the original and the amended claim limitation. *Id.* (citing *Festo VIII*, 535 U.S. at 740). If an alleged equivalent falls within this surrendered territory, there is a presumption of prosecution history estoppel that precludes infringement under the doctrine of equivalents. *Festo IX*, 344 F.3d at 1367.

The patentee bears the burden to show that any narrowing amendment did not surrender the equivalent at issue. *Id.* (citing *Festo VIII*, 535 U.S. at 741). The patentee can only meet this burden by showing: (1) that the equivalent was “unforeseeable” at the time of the amendment; (2) the rationale underlying the amendment bears no more than a tangential relation to the equivalent in question; or (3) some other reason suggesting that the patentee could not reasonably be expected to have described the substitute in question. *Festo VIII*, 535 U.S. at 740-41; *Festo IX*, 344 F.3d. at 1365. In short, the patentee must show that at the time of the amendment one skilled in the art could not reasonably have been expected to draft a claim that literally encompassed the alleged equivalent. *Festo Corp. v.*

*Shoketsu Kinzoku Kogyo Kabushiki Co.*, 304 F.3d 1289, 1290 (Fed. Cir. 2002).

The practice of rewriting a dependent claim into independent form is a narrowing amendment, and that amendment bars the application of the Doctrine of Equivalents for the subject matter added from the dependent claim to the original subject matter of the independent claim. *Honeywell Int'l v. Hamilton Sundstrand Corp.*, 370 F.3d 1131, 1141 (Fed. Cir. 2004).

With respect to argument-based estoppel, the scope of claim coverage is limited by arguments seeking to overcome or distinguish a reference. *Eagle Comtronics, Inc. v. Arrow Commun. Labs., Inc.*, 305 F.3d 1303, 1316 (Fed. Cir. 2002) (citing *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 979 (Fed. Cir. 1999) (holding that the scope of coverage of the claims may change if a patentee has “relinquished [a] potential claim construction in an amendment to the claim or in an argument to overcome or distinguish a reference”)). Also, “[c]lear assertions made during prosecution in support of patentability, *whether or not actually required to secure allowance of the claim*, may also create an estoppel.” *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1583 (Fed. Cir. 1995), *emphasis added*. Any argument-based estoppel affecting a limitation in one claim extends to all claims in which that limitation appears. *Id.* at 1584.

Prosecution History Disclaimer: Prosecution history disclaimer narrows the meaning of a term from the plain and ordinary meaning to a limited meaning based on arguments made during the claim’s prosecution. *Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1324 (Fed. Cir. 2003). The rationale that supports the

doctrine is simple: competitors should be able to rely on statements made during a patent's prosecution; that is, a patentee who disclaims subject matter during prosecution cannot later recapture the subject matter in litigation. *Springs Window Fashions LP v. Novo Indus., L.P.*, 323 F.3d 989, 995 (Fed. Cir. 2003).

**C. Legal standard for definiteness of patent claims.**

The patent statute requires that the claims of a patent “particularly [point] out and distinctly [claim] the subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, Paragraph 2. This definiteness requirement “focuses on whether the claims, as interpreted in view of the written description, adequately perform their function of notifying the public of the [scope of the] patentee's right to exclude.” *S3 Inc. v. nVIDIA Corp.*, 259 F.3d 1364, 1371- 72 (Fed. Cir. 2001). “If one employs means-plus-function language in a claim, one must set forth in the specification an adequate disclosure showing what is meant by that language. If an applicant fails to set forth an adequate disclosure, the applicant has in effect failed to particularly point out and distinctly claim the invention as required by the second paragraph of section 112.” *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005), (quoting *In re Donaldson Co.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) (*en banc*)).

Determining whether a patent claim satisfies the definiteness requirement of 35 U.S.C. § 112, Paragraph 2 is a matter of law for the court. See *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1353 (Fed. Cir. 2003). If a court determines that a claim is not “amenable to construction,” then the claim is invalid as

indefinite. *Exxon Research & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001). An indefinite claim cannot be “fixed” during litigation by a court rewriting them in a way that corrects ambiguous or indefinite language. *Rhine v. Casio, Inc.*, 183 F.3d 1342, 1345 (Fed. Cir. 1999); *Quantum Corp. v. Rodime, PLC*, 65 F.3d 1577, 1584 (Fed. Cir. 1995) (“Although we construe claims, if possible, so as to sustain their validity, it is well settled that ... courts do not redraft claims.”)

### **III. DEFINING THE PERSON OF ORDINARY SKILL IN THE ART**

The Patents-in-Suit state that the alleged inventions are merely combinations of known features. Exhibit A, Col. 3, lines 1 – 2; and Exhibit B, Col. 3, lines 4 – 5. One of ordinary skill in the art is a person having familiarity with these known, or conventional, paper making features. This person would have sufficient experience of about 2 years to appreciate both known machine features and paper making.

Expert opinion is not necessary to explain the claimed subject matter. A person of ordinary skill in this art need not have any specific scientific degree, technical training, or mathematical knowledge. The person of ordinary skill in the art need only comprehend the conventional features in the recited combination. It is from this perspective that the following claim terms are construed.

### **IV. PROPER INTERPRETATION OF THE CLAIMS OF U.S. PATENT NO. 5,718,805**

#### **A. Independent claim 1.**

Independent claim 1 of the '805 Patent is reproduced below.

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second

drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element,

the twin wire zone being free of rolls which deflect the twin wire zone.

Exhibit A, Col. 8, lines 4 – 49, underlining emphasis added.

### 1. The Term “Following”

The second section follows the first section, and the third section follows the second section along the path of the wire belts through the twin wire zone. The accepted meaning of follows is “to go or come after a person or thing in place, time, or sequence.”<sup>2</sup> Sections that go or come in a sequence necessarily occupy discrete physical places. Under the plain and ordinary meaning of claim 1, the first, second, and third sections are discrete physical sections that do not overlap. One of ordinary skill in the art would interpret one section “following” another as

*“coming after [the previous section] in sequence and occupying a discrete physical place.”*

### 2. **The Phrase “neither wire belt defining a single wire predrainage zone”**

In the '805 Patent application (*i.e.*, the '769 Application), Exhibit F, Voith attempted to obtain claims to a twin wire zone that included at least some a single wire predrainage zone. The claims included the addition of “neither wire belt defin[es] a single wire predrainage zone of a substantial length.” Exhibit F, page 14, underlining and bold emphasis added. Voith could not obtain broader claims because every element of the claims was old and disclosed in prior art references. Exhibit G, pages 2-5. Voith’s March 4, 1997 Reply amended the claims to recite

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<sup>2</sup> Exhibit E, *Merriam Webster’s Collegiate Dictionary*, 452 (10<sup>th</sup> Ed. 1995).



“neither wire belt defining a single wire predrainage zone.” Exhibit H, pages 1 - 9, underlining added. Voith surrendered all twin wire formers having any single wire predrainage zone and it cannot recapture the prior art technology through equivalents. “[N]either wire belt defining a single wire predrainage zone” is limited to the literal meaning:

*“neither wire belt has any single wire predrainage.”*

### 3. The Terms of the “First Section”

The components of the first section are: (a) “a first drainage element at the start of the path through the twin wire zone,” (b) “means for supporting the belts for forming a wedge shaped entrance slot into the first section,” and (c) “a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot[.]” See Exhibit C, pages 3 - 4; and Exhibit A, Col. 8, lines 14 – 21.

#### **(a) The Phrase “a first drainage element at the start of the path through the twin wire zone”**

The '805 Patent specification gives the “first drainage element” special meaning as the particular drainage devices: a rotating forming cylinder, a curved stationary forming shoe, or drainage strips. Exhibit A, Col. 3, lines 7 – 10; and Col. 6, lines 50 – 62. And “as a rule” the rotating forming cylinder is a suction roll. Exhibit A, Col. 6, lines 19 – 23. Based on the special meaning in the specification, the first drainage element of the '805 Patent can be a suction roll or a curved stationary forming shoe.

The '805 Patent states the further limitation that the first drainage element may be a straight forming shoe but only in undefined "certain situations." Exhibit A, Col. 4, lines 14-16. Since the public cannot determine what would qualify as a "certain situation," the first drainage element cannot be a straight forming shoe.

The '805 Patent also provides a special meaning for the term "drainage" in the first section:

For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

Exhibit A, Col. 5, lines 26 – 30, underlining emphasis added. The drainage element in the first section must cause drainage toward both sides. But the '805 Patent never defines "a known pre-drainage." Additionally, Voith distinguished its claims over the prior art Patent No. 4,925,531 ("Koski," Exhibit J) by stating that Koski's deflectors in the first section are not drainage elements:

Koski, on the other hand, teaches several deflectors 24 at a location similar to the one where the curved drainage element in the first section of claim 13 appears. Such deflectors are not drainage elements.

Exhibit I, Page 5, underlining emphasis added. Contrary to Voith's assertion, Koski states: "there is one or several deflectors 24 which remove water out of the web W that is being formed." Exhibit J, Col. 4, lines 24 – 29. Voith unambiguously argued that Koski's drainage deflectors are not the claimed drainage element of the '805 Patent. Since the claim 1 "drainage strips" recited in the second section are deflectors, Voith has disclaimed drainage strips in the first section of the claimed twin wire former. Exhibit A, Col. 5, lines 21 – 24.

One of ordinary skill in the art would interpret “a first drainage element at the start of the path through the twin wire zone” as limited to

*“either a suction roll or a curved stationary forming shoe within the twin wire zone that results in drainage from both sides of the twin wire zone.”*

**(b) The Phrase “means for supporting the belts for forming a wedge shaped entrance slot into the first section”**

The function of this means for element is “supporting the belts for forming a wedge shaped entrance slot into the first section.” The ’805 Patent describes two different structures for performing this function: 1) breast rolls 13 and 14, and 2) suction roll 40 in combination with breast roll 13. Exhibit A, Figures 1 – 5; Col. 4, lines 12 – 13; and Col. 6, lines 20 – 24. One of ordinary skill in the art would interpret “means for supporting the belts for forming a wedge shaped entrance slot into the first section” as

*“two breast rolls or a breast roll and a suction roll that support the belts to form a wedge shaped entrance slot into the first section.”*

**(c) The Phrase “a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot”**

One of ordinary skill in the art understands the meaning of “fiber suspension supplying headbox.” However, the claim limitation “placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot” has a special meaning in the ’805 Patent:

The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16.

Exhibit A, Col. 4, lines 6 – 10, underlining added. Each figure of the '805 Patent illustrates the only to the place where the wire travels over the first drainage element. Exhibit A, Drawing Sheets. One of ordinary skill in the art in view of the above and the lack of a single wire zone would interpret “a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot” as

*“a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension only at the place where the lower wire in the first section of the twin wire zone travels over the stationary curved forming shoe or suction roll and forms a wedge shaped entrance.”*

#### 4. The Terms of the “Second Section”

As recited in claim 1 of the '805 Patent, the components of the second section are: (a) first drainage strips and second drainage strips; (b) first support means for resiliently supporting the first drainage strips and second support means supporting the second drainage strips rigidly; and (c) first and second means for collecting water. In particular, claim 1 recites:

in the second section,

a plurality of first drainage strips are positioned for contacting the first wire belt;

...

a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt;

...

first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips; [and]

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips... .

Exhibit A, Col. 8, lines 22 – 42. The '805 Patent separates these components from the first section:

The inventors have found that a combination of known features, namely:

A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage

B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe

C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. ...

Exhibit A, Col. 3, lines 1 – 17, underlining added. The '805 Patent also states that the “extremely high increase in the quality of the finished fiber web” and the alleged invention cannot be achieved unless the second section components are physically isolated both from the first and third sections:

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible)

deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

Exhibit A, Col. 5, lines 15-30, underlining and bold emphasis added. In other words, the drainage strips and their associated structures cannot be located in any other section. Based on the plain language of claim 1 and the '805 Patent's explicit requirements, one of ordinary skill in the art would interpret "the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone" as

*"the twin wire zone having a second section coming after the first section in sequence and occupying a discrete physical place along the path of the belts through the twin wire zone, wherein the components of the second section are not located in any other section."*

**(a) First Drainage Strips and Second Drainage Strips**

**(i) The Phrase "a plurality of first drainage strips are positioned for contacting the first wire belt"**

The '805 Patent describes the stationary curved forming shoe in the first section as including "several strips 16' with drainage slits present between them." Exhibit A, Col. 4, lines 6 – 12. However, the '805 Patent goes further to state that these forming shoe strips are not drainage strips in the second section. Exhibit A, Col. 5, lines 15 – 30. Claim 1 also distinguishes the plurality of first drainage strips and the plurality of second drainage strips; the plurality of first drainage strips are resiliently supported while the plurality of second drainage strips are rigidly supported. Exhibit A, Col. 8, lines 32 – 36. The '805 Patent further notes, "Instead

of a rigidly supported [second] strip, a feed or discharge edge of a drainage box can also be provided.” Exhibit A, Col. 7, lines 65 – 67. Since these structures are specific for the rigidly supported strips, a resiliently supported first strip cannot be a feed or discharge edge of a drainage box.

One of ordinary skill in the art would interpret “a plurality of first drainage strips are positioned for contacting the first wire belt;” as

*“a plurality of first drainage strips that are not forming shoe strips, are not feed or discharge edges of drainage boxes, and are positioned for contacting the first wire belt.”*

**(ii)The Phrase “a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt”**

As set forth immediately above, the Patents-in-Suit state that drainage strips are not forming shoe strips. One of ordinary skill in the art would interpret “a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt” as

*“a plurality of second drainage strips that are not forming shoe strips positioned within the loop of the second wire belt for contacting the second wire belt.”*

Claim 1 also recites the specific orientation of the first and second drainage strips:

the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship[.]

Exhibit A, Col. 8, lines 29 – 32. As stated in the ’805 Patent Summary of the Invention, the alleged invention must have “strips which are arranged along a “zig-

zag” line... .” Exhibit A, Col. 3, lines 11 – 14. The ’805 Patent defines “zig-zag”:

It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a “zig-zag” arrangement (i.e. non-opposing relationship) is present.

Exhibit A, Drawing Sheet 1 and Col. 4, lines 59 – 62. Based on the requirement for zig-zag strips and the clear definition of the same, one of ordinary skill in the art would interpret “the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship” to mean

*“each of the first strips and the second strips lies in the region that is spaced between two of the opposite strips.”*

Voith stated that the prior art Patent 4,769,111, Exhibit L, shows “flexibly supported battens in a twin wire former. The battens, however, are not displaced as set forth in applicants’ invention.” Exhibit K, pages 1 and 3. Based on the recited requirement for the zig-zag arrangement and Voith’s distinction of the same over the prior art, Voith is limited to a literal claim meaning and cannot recapture equivalents of the recited strip arrangement.

**(b) First Support Means for Resiliently Supporting the First Drainage Strips and Second Support Means Supporting the Second Drainage Strips Rigidly**

**(i) The Phrase “first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact”**

The structures for “resiliently supporting the first drainage strips against the respective wire belt that the strips contact” are springs, pneumatic pressure cushions, or a water permeable plate. Exhibit A, Col. 4, lines 25 – 26. One of



ordinary skill in the art would interpret “first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact” as

*“springs, pneumatic pressure cushions, or a water permeable plate that are associated with the first drainage strips and resiliently support them against the respective wire belt.”*

**(ii) The Phrase “second support means supporting the second drainage strips rigidly against the second wire belt”**

The '965 Application, from which the '805 Patent is a continuation, included claims that only recited a single “means for resiliently supporting at least one of the first and second drainage strips against the respective wire belt that the strip contacts... .” Exhibit M, page 3. The USPTO rejected that broad recital because Voith only described how to make and use a machine with “flexibly supported strips located opposite rigidly supported strips... .” Exhibit N, page 2, underlining emphasis added. The USPTO also rejected the claims as known in the prior art German reference DE 3 183 133 (“DE 133”); or the “Tissari” or “Koski” Patents in view of DE 133. Exhibit N, pages 3 – 5. In particular, the Examiner stated:

Tissari ... shows every feature claimed ... except it does not specify that at least one of the strips ... are “resiliently supported”. Likewise Koski’s sole Figure shows every feature of [the claims] except at least one or more of [the] deflectors ... being “resiliently mounted”. However the artisan is well aware of the option and advantages of resiliently supported dewatering ribs/strips as evidenced by DE 3138133.

Exhibit N, pages 4 – 5, underlining added. Voith amended the claims by adding the following underlined text and deleting bracketed text:

first support means for resiliently supporting [at least one of] the first

[and second] drainage strips against the respective wire belt that that strip contacts;

second support means supporting the at least one second drainage strip rigidly against the second wire belt.

Exhibit O, page 2, underlining and bracketing in original. Voith also stated:

Neither Tissari nor Koski disclose or suggest that the dewatering ribs/strips employed therein should have one set which is resiliently mounted and the other set rigidly mounted. In view of the foregoing, applicants respectfully submit that claim 13 is patentable over Tissari, Koski and DE '133, either considered singly or in combination.

*Id.*, page 5.

The second means must be associated only with the second drainage strips. But, the Patents-in-Suit do not disclose structures for “supporting the second drainage strips rigidly against the second wire belt” and the limitation renders the claim insolubly ambiguous and indefinite. One of ordinary skill in the art would interpret “second support means supporting the second drainage strips rigidly against the second wire belt” as

*“an indefinite structure for supporting the second drainage strips rigidly against the second wire belt.”*

**(c) First and Second Means for Collecting Water**

- (i) The Phrase “first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips”**

The first means is recited in lines 32 – 33 of the '769 Application claim 1, as filed; the second means is recited in lines 35 – 37. Exhibit F, pages 14 – 15. The USPTO rejected the '769 Application claims reciting these limitations and stated:

[I]t is unclear which strips first and second means for collecting water is meant for, all of the first and second drainage strips are implied in the current language, yet that is not clear nor supported by the specification. It appears that --second-- should be inserted before “drainage” on line 33 and line 36 of claim 1 to be clear and consistent with the specification.

Exhibit G, page 2; the underlining was handwritten by the Examiner in the original. In reply, Voith stated:

With respect to the rejection under 35 U.S.C. §112 concerning lines 33 and 36 of claim 1, applicants respectfully submit that the present language is clear. Since it does not matter whether the most upstream one of the drainage strips is a first drainage strip or a second drainage strip, the interpretation given to the language by the Examiner is correct and is the intended meaning.

Exhibit H, page 9, underlining added. Based on Voith’s unambiguous affirmation of the Examiner’s interpretation, the function of the first means must be interpreted as “collecting water drained from the fiber suspension by the most upstream one of the drainage strips, whether that strip is a first or second strip.”

In the closest embodiment disclosed in the ’805 Patent: a vacuum chamber 21 in a drainage box 18 collects water drained solely from the most upstream strip through a vertical channel 21a; the vacuum chamber 22 in the drainage box 18 collects water drained only from the other strips on the same side of the wire belts as the most upstream strip; and, drainage box 17 collects water only from the strips on the other side of the wire belts. Exhibit A, Col. 4, lines 17 – 47. One of ordinary skill in the art would interpret “first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips” as

*“a vacuum chamber, in a drainage box, that collects water drained by the most upstream one of the drainage strips through a vertical*

*channel.”*

(ii) The Phrase “second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips”

As stated in section (i) immediately above, Voith defined this means-plus-function limitation as collecting the water drained from the fiber suspension by all of the remaining first and second strips. However, the '805 Patent does not disclose any such structure for performing this function. See Exhibit A, Drawing Sheets. Since the Patents-in-Suit fail to describe the structures associated with this means-plus-function element, claim 1 is insolubly ambiguous and indefinite. One of ordinary skill in the art would interpret “second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips” as

*“an indefinite structure, separate from the vacuum chamber, the drainage box and the vertical channel, for collecting the water drained from the fiber suspension by all of the remaining first and second strips.”*

## 5. The Terms of the “Third Section”

As recited in claim 1, the third section does not start within the second section but, instead, it follows “the second section along the path of the wire belts through the twin wire zone.” Exhibit A, Col. 8, lines 22 – 24. The specification also establishes the critical requirement that the components of the second section do not extend into the third section:

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect.

Exhibit A, Col. 5, lines 15 – 19, underlining emphasis added. One of ordinary skill in the art would interpret “the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone” as

*“a third section coming after the second section in sequence and occupying a discrete physical place along the path of the wire belts, wherein no component of the third section is located in any other section.”*

The only recited component of the third section is “a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element[.]” The second drainage element is given a special meaning in the specification as a curved forming shoe. Exhibit A, Col. 5, line 4. One of ordinary skill in the art would interpret this limitation as

*“a curved forming shoe positioned in the third section so one of the wire belts travels over the curved forming shoe.”*

## **6. All Sections are Free of Rolls Which Deflect the Twin Wire Zone**

Claim 1 recites “the twin wire zone being free of rolls which deflect the twin wire zone.” As filed, the ’769 Application claim 1 did not recite this limitation. Exhibit F, pages 14 -15. The USPTO rejected claim 1 and its dependent claims 2 – 4 as anticipated or obvious over a variety of prior art references. Exhibit G, pages 3 – 6. However, the examiner indicated the allowability of dependent claim 5 if presented as an independent claim. Claim 5 originally recited: “The twin wire former of claim 1, wherein the twin wire zone is free of rolls which deflect the twin wire zone.” Exhibit F, page 15. In Reply, Voith re-wrote claim 5 to include the limitations of claim 1; Exhibit H, pages 1 – 2; and the USPTO issued a Notice of

Allowability, Exhibit P. Voith is restricted to the literal meaning of this limitation by its amendment and cannot recapture its equivalents. One of ordinary skill in the art would interpret this limitation as

*“the entire twin wire zone must be free of any deflection rolls.”*

## 7. Summary

Based on the foregoing, claim 1 must be construed as

A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt has any a single wire predrainage;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes either a suction roll or a curved stationary forming shoe within the twin wire zone that results in drainage from both sides of the twin wire zone; two breast rolls or a breast roll and a suction roll that support the belts to form a wedge shaped entrance slot into the first section; a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension only at the place where the lower wire in the first section of the twin wire zone travels over the stationary curved forming shoe or suction roll and forms a wedge shaped entrance;

the twin wire zone having a second section coming after the first section in sequence and occupying a discrete physical place along the path of the belts through the twin wire zone, wherein the components of the second section are not located in any other section,

a plurality of first drainage strips that are not forming shoe strips, are not feed or discharge edges of drainage boxes, and are positioned for contacting the first wire belt; and a plurality of second drainage strips that are not forming shoe strips positioned within the loop of the second wire belt for contacting the second wire belt; each of the first

strips and the second strips lies in the region that is spaced between two of the opposite strips;

springs, pneumatic pressure cushions, or a water permeable plate that are associated with the first drainage strips and resiliently support them against the respective wire belt;

an indefinite structure for supporting the second drainage strips rigidly against the second wire belt;

a vacuum chamber, in a drainage box, that collects water drained by the most upstream one of the drainage strips through a vertical channel; and

an indefinite structure, separate from the vacuum chamber, the drainage box and the vertical channel, for collecting the water drained from the fiber suspension by all of the remaining first and second strips; and

a third section coming after the second section in sequence and occupying a discrete physical place along the path of the wire belts, wherein no component of the third section is located in any other section;

a curved forming shoe positioned in the third section so one of the wire belts travels over the curved forming shoe,

the entire twin wire zone must be free of any deflection rolls.

## **B. Independent claim 2.**

Independent claims 1 and 2 have the following differences.<sup>3</sup>

### **1. Free of Forming Rolls**

The last limitation of claim 1 recites, “the twin wire zone being free of rolls which deflect the twin wire zone,” while the last limitation of claim 2 recites, “the twin wire zone being free of any forming rolls.” Exhibit C, page 8; and Exhibit A,

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<sup>3</sup> The '805 Patent claims 1 and 2 vary by three punctuation marks and one mis-spelling, which do not affect the meaning of the claim 2 with respect to claim 1. See Exhibit C and Exhibit A, Col. 8, line 4 – Col. 9, line 31. With respect to these changes, the interpretation of claim 1 applies to claim 2.

Col. 8, lines 50 – 51; and Col. 9, lines 30 – 31. As filed, the '769 Application claim 1 did not recite either limitation. Exhibit F, pages 14 -15. The USPTO rejected claim 1 and its dependent claims 2 – 4 as anticipated or obvious over a variety of prior art references. Exhibit G, pages 3 – 6. The examiner did indicate that dependent claim 6 would be allowable over the cited prior art if re-written in independent form. Claim 6 originally recited, “The twin wire former of claim 1, wherein the twin wire zone is free of any forming rolls.” Exhibit F, page 15. In Reply, Voith combined claims 1 and 6; Exhibit H, pages 2 – 4; and claim 6 issued as claim 2 of the '805 Patent. Exhibit P, page 1. Voith is restricted to the literal meaning of this limitation by its amendment and cannot recapture its equivalents. One of ordinary skill in the art would understand the plain language of this limitation:

*“the entire twin wire zone must be free of forming rolls.”*

## **2. No Suction Roll**

As interpreted in section IV.A.3.a. above, the claim 1 first drainage element is “either a suction roll or a curved stationary forming shoe.” Since the suction roll is a forming roll; Exhibit A, Col. 6, lines 20 – 21; and the twin wire former of claim 2 is free of forming rolls, the claim 2 drainage element must be construed as

*“a curved stationary forming shoe within the twin wire zone that results in drainage from both sides of the twin wire zone.”*

For the same reasons, the fiber suspension supplying headbox cannot deliver suspension to a suction roll. Instead, the placement of the headbox must be construed as

*“placed and directed for delivering fiber suspension only where the*



*lower wire in the first section of the twin wire zone travels over the curved stationary forming shoe and forms a wedge shaped entrance.”*

**C. Independent claim 3.**

In addition to the limitations of claim 1, claim 3 recites: 1) the plurality of first drainage strips are positioned “within the loop of the first wire belt;” 2) “the last one of the second drainage strips being located downstream of the last one of the first drainage strips;” and, 3) the “second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith.” See Exhibit C; and Exhibit A, Col. 8, lines 4 – 51 and Col. 9, line 31 – Col. 10, line 10. Claim 3 does not recite the “first means for collecting water...” or the “second means separate from the first means for collecting water...” *Id.* One of ordinary skill in the art would interpret claims 1 and 3 identically and these linguistic changes do not alter the scope of the claim.

**D. Independent claim 4.**

In comparison to claim 1, claim 4 includes the combined changes present in independent claims 2 and 3. See Exhibit C; and Exhibit A, Col. 8, lines 4 – 51 and Col. 10, lines 11 – 53. One of ordinary skill in the art would interpret claim 4 as presented in sections IV.A., above, with the changes identified in sections IV.B. and IV.C., above.

**E. Independent claim 5.**

Claim 5 recites that the first section includes a “single drainage element.” See Exhibit C; and Exhibit A, Col. 8, lines 4 – 51 and Col. 10, line 54 – Col. 12, line 21. Claim 5 further recites “said single first drainage element in the first section being

a single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the single forming roll being engaged by one of the wire belts for curving the path of the belts around the single forming roll after the entrance of the suspension into the entrance slot.” *Id.* As presented in section IV.A.3.a., the ’805 Patent defines “forming roll” as “suction roll.”

Claim 5 also: 1) recites that the plurality of first drainage strips “are positioned in the loop of the first wire belt;” 2) substitutes the first and second means for collecting water with “means for supplying a vacuum in the area of the second drainage strips;” 3) recites that the “second drainage element ha[s] an open surface to enable water to be drained through the wire belt in contact therewith;” and, 4) modifies the last limitation: “the twin wire zone apart from said single forming roll being free of rolls which deflect the twin wire zone.” *Id.*

One of ordinary skill in the art would interpret claim 5 like claim 1 but for these linguistic changes, which further limit the claim.

## **V. PROPER INTERPRETATION OF THE CLAIMS OF U.S. PATENT NO. 5,972,168**

The Patents-in-Suit both issued from continuation applications of U.S. Application No. 07/773,965. Exhibit A, Col. 1, lines 1 – 11; and Exhibit B, Col. 1, lines 1 – 14. And the ’168 Patent application was a continuation of the ’805 Patent application. Under 35 U.S.C. §120, the specifications of the ’805 Patent and the ’168 Patent cannot vary but for insubstantial details of form and the ’168 Patent includes the same special definitions of claim terms as the ’805 Patent. In addition,

the prosecution history of the '805 Patent applies with equal effect to the '168 Patent claims. See *Biovail*, 239 F.3d at 1301.

**A. Independent claim 3.**

Independent claim 3 of the '168 Patent is presented first since it is an apparatus claim like those previously interpreted. By comparison to the '805 Patent claim 1, with brackets indicating deleted language and underlining indicating added language, the '168 Patent independent claim 3 recites:

A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts [, means for directing the wire belts to] which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a [first drainage element] single forming roll at the start of the path of the wire belts through the twin wire zone [, means for supporting the]; supports which support the wire belts for forming a wedge shaped entrance slot into the first section[,];

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the

second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support [means for] which resiliently [supporting] supports the first drainage strips against the [respective] first wire belt that the first strips contact;

a second strip support [means supporting] which supports the second drainage strips rigidly against the second wire belt;

[first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and]

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; [a second] drainage [element] elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the [second drainage element,] drainage elements, the drainage elements including at least one stationary dewatering element followed by a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone.

See Exhibit D; Exhibit A, Col. 8, lines 4 – 49; and Exhibit B, Col. 8, line 50 – Col. 9, line 40.

As shown above, Voith deleted the “means for directing the wire belts to travel along a path together.” This makes it unclear how the first and second web forming wire belts are associated with each other or the former. This lack of a structural connection renders the claim ambiguous and invalid under 35 U.S.C.

§112, second paragraph.

Voith attempted to insert a structure for the term “means” in the following mean-plus-function limitations: 1) “means [supports]” for supporting the belts for forming a wedge shaped entrance slot; 2) “means [supports]” for resiliently supporting the first drainage strips against the respective wire belt that the strips contact; and 3) “means [supports]” supporting the second drainage strips rigidly against the second wire belt. There is no support in the specification for the structure of “*supports* which *support* the wire belts,” “a first strip *support* which resiliently *supports* the first drainage strips,” or “a second strip *support* which *supports* the second drainage strips.” These limitations are in means-plus-function format and must be interpreted the same as the corresponding mean-plus-function limitations in the ’805 Patent claim 1. Since the structure corresponding to the means “which supports the second drainage strips” is not disclosed in the specification, the claim is invalid as indefinite under 35 U.S.C. §112, second paragraph. See section IV.A.4.b.

One of ordinary skill in the art would otherwise interpret the ’168 Patent claim 3 like the ’805 Patent claim 1 but for the linguistic changes. If these linguistic changes alter the ’168 Patent interpretations, they further limit the scope of claim 3.

#### **B. Independent claim 7.**

By comparison to claim 3, claim 7 recites a “stationary curved forming shoe” instead of “single forming roll” with respect to the first section. See Exhibit D; and

Exhibit B, Col. 8, line 50 – Col. 4, line 36; and Col. 10, line 17 – Col. 11, line 4. And “a stationary drainage element followed by a suction roll” instead of a “drainage element” in the third section. *Id.* But for these linguistic changes, one of ordinary skill in the art would interpret claim 7 like claim 3, or find that they further limit the scope of claim 7.

**C. Independent claims 1 and 5.**

Although these method claims do not recite “first section,” “second section,” or “third section,” each recites serially “feeding the wire belts” across unique components. See Exhibit D; and Exhibit B, Col. 8, lines 4 – 47 and Col. 9, line 39 – Col. 10, line 14.

Method claim 1 recites uniquely positioned components that correspond to the uniquely positioned components recited in apparatus claim 3. Exhibit D; and Exhibit B, Col. 8, lines 4 – 47 and Col. 8, line 50 – Col. 4, line 36. Method claim 1 does recite a “stationary drainage element and then ... a suction roll” where apparatus claim 3 recites “drainage elements.” *Id.* This linguistic difference result only in a more limited scope of method claim 1.

Method claim 5 recites uniquely positioned components that correspond to the uniquely positioned components recited in apparatus claim 7. See Exhibit D; and Exhibit B, Col. 9, line 39 – Col. 10, line 14 and Col. 10, line 17 – Col. 11, line 4.

One of ordinary skill in the art would interpret each of the method claims 1 and 5 as steps of using the apparatus recited in claims 3 and 7, respectively. In particular, the methods required “feeding wire belts” through a discrete first section

that follows a discrete second section, which follow a discrete third section.

**D. Dependent claims 2, 4, 6, and 8.**

One of ordinary skill in the art would understand the plain and ordinary meaning of dependent claims 2, 4, 6, and 8.

**CONCLUSION**

For the aforementioned reasons, JohnsonFoils asks this Court to make the following determinations as a matter of law: 1) that claims 1 – 5 of the '805 Patent are indefinite and invalid, 2) that claims 1 – 8 of the '168 Patent are indefinite and invalid and 3) to the extent that the claims can be interpreted, that claims 1 - 5 of the '805 Patent and claims 1-8 of the '168 Patent must be construed as set forth above.

Respectfully submitted,

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Date: January 16, 2008

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# **EXHIBIT A**

US005718805A

**United States Patent** [19][11] **Patent Number:** **5,718,805****Egelhof et al.**[45] **Date of Patent:** **\*Feb. 17, 1998**[54] **TWIN WIRE FORMER**

[75] Inventors: **Dieter Egelhof**; **Klaus Henseler**, both of Heidenheim, Germany; **Werner Kade**, Neenah, Wis.; **Albrecht Meinecke**, Heidenheim, Germany; **Wilhelm Wanke**, Heidenheim, Germany; **Hans-Jurgen Wulz**, Heidenheim, Germany; **Rudolf Bück**, deceased, late of Heidenheim, Germany, by **Else Bück**, legal representative

[73] Assignee: **J. M. Voith GmbH**, Heidenheim, Germany

[\*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,500,091.

[21] Appl. No.: **556,769**

[22] Filed: **Nov. 2, 1995**

**Related U.S. Application Data**

[63] Continuation of Ser. No. 286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of Ser. No. 55,918, Apr. 29, 1993, Pat. No. 5,389,206, which is a continuation of Ser. No. 773,965, filed as PCT/EP90/01313, Sep. 8, 1990, abandoned.

[30] **Foreign Application Priority Data**

Aug. 22, 1989 [DE] Germany ..... 39 27 597.3

[51] Int. Cl.<sup>6</sup> ..... **D21F 1/00**

[52] U.S. Cl. .... **162/301; 162/300**

[58] Field of Search ..... 162/203, 300, 162/301, 303, 348, 352

[56] **References Cited****U.S. PATENT DOCUMENTS**

3,994,774 11/1976 Halme et al. .... 162/301  
4,425,187 1/1984 Armstrong et al. .... 162/300  
4,532,008 7/1985 Creagan et al. .... 162/203

4,609,435 9/1986 Tissari ..... 162/352  
4,769,111 9/1988 Nevalainen et al. .... 162/351  
4,917,766 4/1990 Koivuranta et al. .... 162/301  
4,925,531 5/1990 Koski ..... 162/301  
5,078,835 1/1992 Schiel et al. .... 162/352  
5,185,064 2/1993 Nyma ..... 162/301  
5,389,206 2/1995 Buck et al. .... 162/301  
5,500,091 3/1996 Buck et al. .... 162/301

**FOREIGN PATENT DOCUMENTS**

0289445 4/1988 European Pat. Off. .  
0296135 6/1988 European Pat. Off. .  
0306759 8/1988 European Pat. Off. .  
3138133 9/1981 Germany .  
3321406 6/1983 Germany .  
3329833 8/1983 Germany .  
3628282 8/1986 Germany .  
8806036.5 5/1988 Germany .  
1125906 10/1965 United Kingdom .  
8604368 7/1986 WIPO .  
9102842 3/1991 WIPO ..... 162/301

**OTHER PUBLICATIONS**

Tappi Press "1989 Twin-Wire Seminar", Washington Hilton, Washington, D.C., Apr. 12-14, 1989, pp. iii, 103-114.

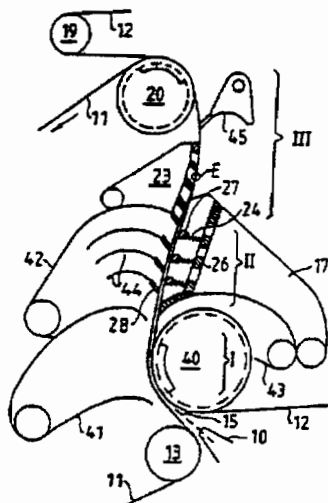
*Primary Examiner*—Karen M. Hastings

*Attorney, Agent, or Firm*—Ostrolenk, Faber, Gerb & Soffen, LLP

## [57]

**ABSTRACT**

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16), or a forming roll (40). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

**5 Claims, 2 Drawing Sheets**

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Fig.1

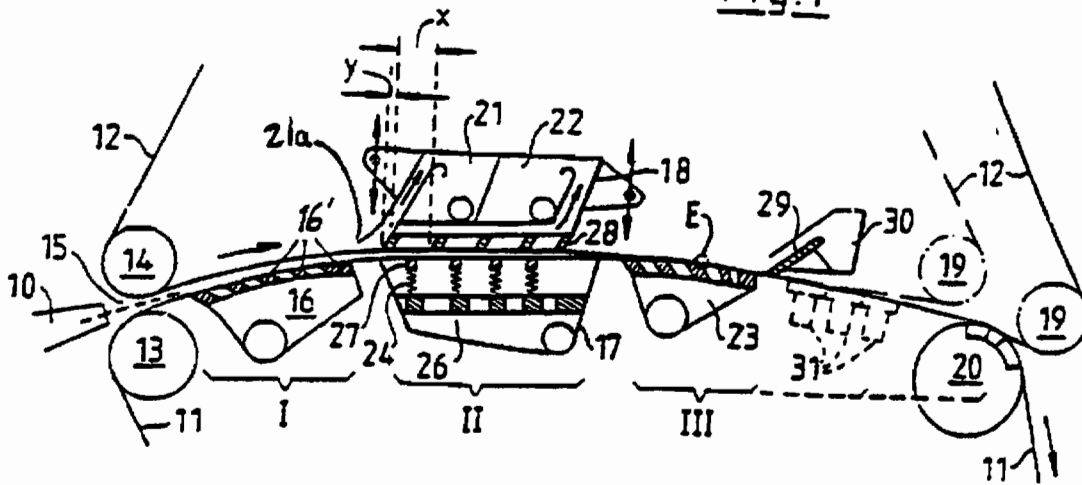


Fig.2

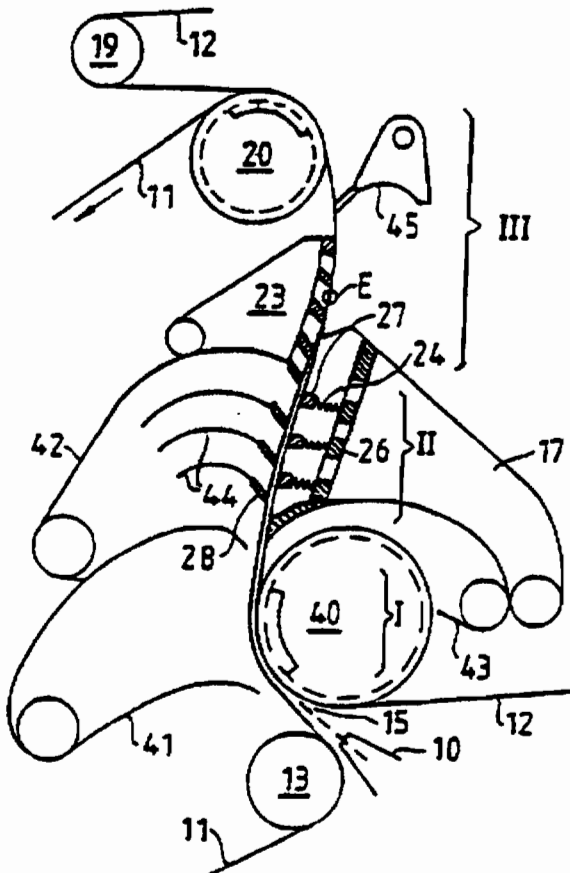
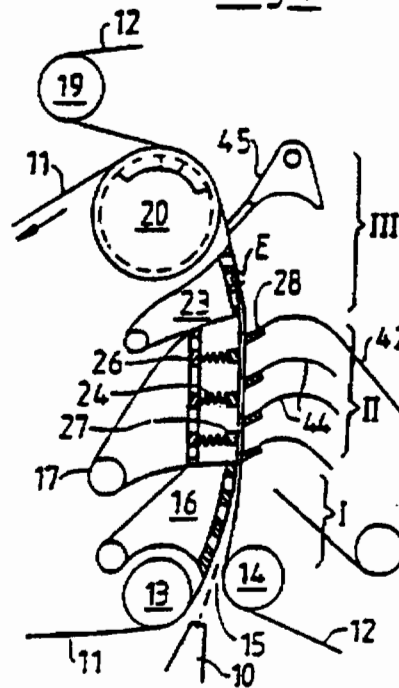


Fig.3



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Fig.4

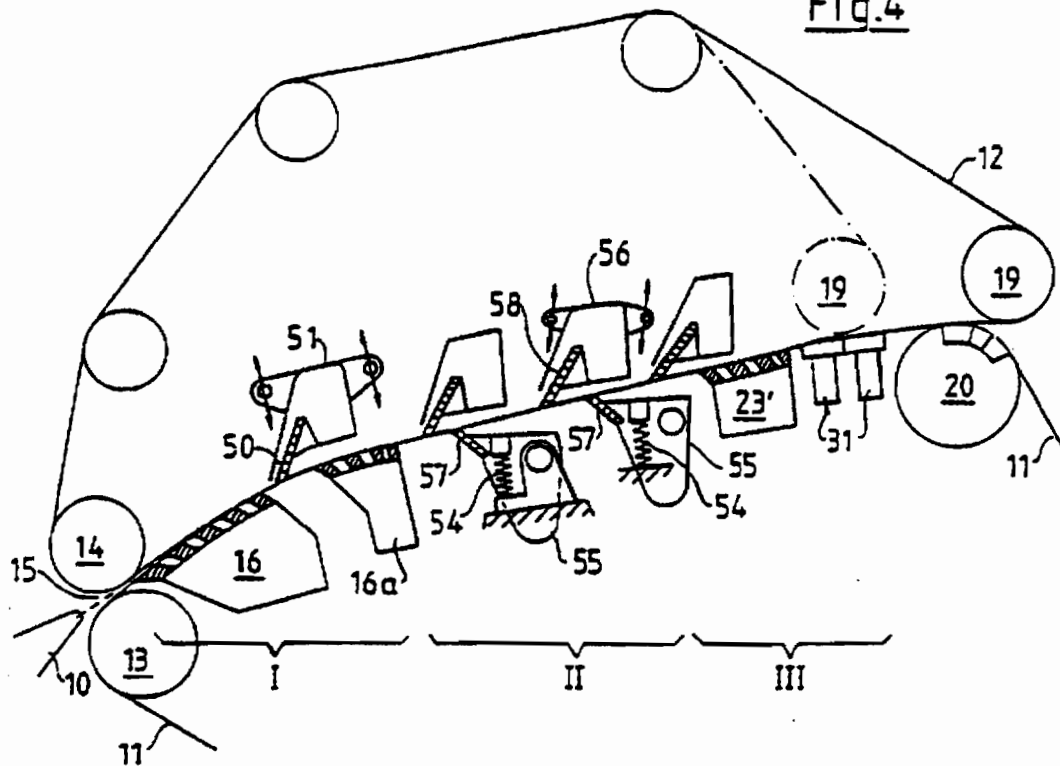
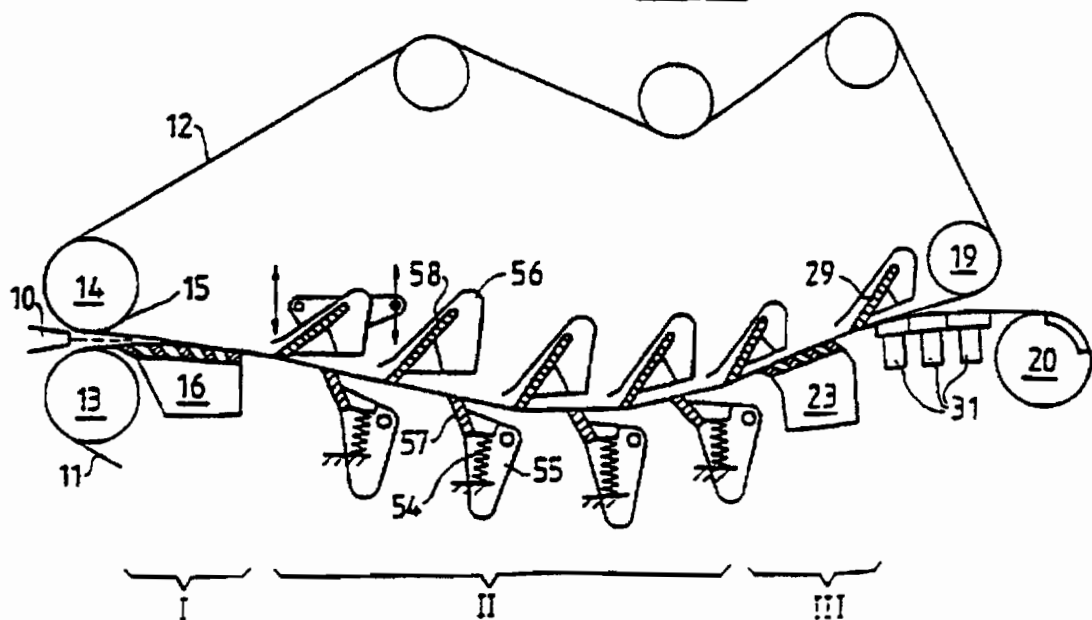


Fig.5





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**TWIN WIRE FORMER****RELATED APPLICATIONS**

This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Ser. No. 08/286,948, filed Aug. 8, 1994 now U.S. Pat. No. 5,500,091, which is a continuing application Ser. No. 08/055,918, filed Apr. 29, 1993, issued Feb. 14, 1995 as U.S. Pat. No. 5,389,206, which is a continuing application Ser. No. 07/773,965, filed as PCT/EP90/01313 Sep. 8, 1990, now abandoned.

**BACKGROUND OF THE INVENTION**

The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from a fiber suspension. The invention proceeds from the basis of the twin-wire former known from British Patent 1 125 906. The features indicated in the patent include a twin wire former for producing a fiber web and particularly a paper web from a fiber suspension. Two web forming wire belts, in the form of endless loops, travel together to form a twin wire zone. The web travels between and along the path of the wire belts through the twin wire zone. The twin wire zone has three sections and the elements in those three sections are described below. The patent describes features that state, in other words, that the forming of the fiber web from the pulp suspension fed from the headbox takes place exclusively between two wire belts. Thus, there is no so-called single-wire pre-drainage path. In a first section of the twin-wire zone, the two wire belts together form a wedge-shaped inlet slot; a jet of pulp slurry coming from the headbox discharges into it. The jet strikes the two wire belts at a place where they pass over a curved drainage element; in the case of the aforementioned British patent, this is a stationary, curved forming shoe. Its curved wire guide surface is formed of a plurality of strips with drainage slots between them. This forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box). Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation, a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counter-

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acts the danger of reflocculation. This is true also of the drainage strips arranged in the British patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said British patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

**SUMMARY OF THE INVENTION**

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

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The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duo-former D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duo-former D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

#### BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises

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three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12-upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag" arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II. Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips



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could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately

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the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

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Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and 58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone, as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably  $n$  flexibly supported strips 27/57 and  $n+1$  rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number  $n$

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of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the twin wire zone being free of rolls which deflect the twin wire zone.

2. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber sus-



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pension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact; second support means supporting the second drainage strips rigidly against the second wire belt; first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips; second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone: a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the twin wire zone being free of any forming rolls.

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone; each wire belt forming an endless loop; the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips; second support means supporting the second drainage strips rigidly against the second wire belt;

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the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and the twin wire zone being free of rolls which deflect the twin wire zone.

4. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone; each wire belt forming an endless loop; the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips; second support means supporting the second drainage strips rigidly against the second wire belt; the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element; and the twin wire zone being free of any forming rolls.

5. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising: first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone; each wire belt forming an endless loop; the twin wire zone having a first section which includes a single first drainage element at the start of the path

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through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; said single first drainage element in the first section being a single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the single forming roll being engaged by one of the wire belts for curving the path of the belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts

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with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll being free of rolls which deflect the twin wire zone.

\* \* \* \* \*

# **EXHIBIT B**

# United States Patent

Egelhof et al.

[19]

[11] Patent Number: 5,972,168

[45] Date of Patent: Oct. 26, 1999

[54] TWIN WIRE FORMER

[75] Inventors: Dieter Egelhof, Klaus Henseler, both of Heidenheim, Germany; Werner Kade, Neenah, Wis.; Albrecht Meinecke, Heidenheim, Germany; Wilhelm Wanke, Heidenheim, Germany; Hans-Jurgen Wulz, Heidenheim, Germany; Rudolf Bück, deceased, late of Heidenheim, Germany, by Elsie Bück, legal representative

|           |         |                   |         |
|-----------|---------|-------------------|---------|
| 3,582,467 | 6/1971  | Gustafson et al.  | 162/303 |
| 3,726,758 | 4/1973  | Parker et al.     | 162/273 |
| 3,772,145 | 11/1973 | Notbohm           | 162/273 |
| 3,994,774 | 11/1976 | Halme et al.      | 162/301 |
| 4,609,435 | 9/1986  | Tissari           | 162/301 |
| 4,769,111 | 9/1988  | Nevalainen et al. | 162/351 |
| 4,917,766 | 4/1990  | Koivuranta et al. | 162/301 |
| 4,925,531 | 5/1990  | Koski             | 162/301 |
| 4,999,087 | 3/1991  | Ebihara et al.    | 162/301 |
| 5,389,206 | 2/1995  | Buck et al.       | 162/301 |

[73] Assignee: Voith Sulzer Papiertechnik Patent GmbH, Germany

## FOREIGN PATENT DOCUMENTS

|         |        |           |
|---------|--------|-----------|
| 3138133 | 9/1981 | Germany . |
| 3321406 | 6/1983 | Germany . |

[21] Appl. No.: 09/161,138

[22] Filed: Sep. 25, 1998

## Related U.S. Application Data

[62] Continuation of application No. 09/023,435, Feb. 13, 1998, which is a continuation of application No. 08/556,769, Nov. 2, 1995, Pat. No. 5,718,805, which is a continuation of application No. 08/286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of application No. 08/055,918, Apr. 29, 1993, Pat. No. 5,389,206, which is a continuation of application No. 07/773,965, abandoned, filed as application No. PCT/EP90/01313, Sep. 8, 1990.

[51] Int. Cl.<sup>6</sup> ..... D21F 1/00

[52] U.S. Cl. .... 162/203; 162/301

[58] Field of Search ..... 162/203, 300, 162/301, 303, 348, 352

[56] References Cited

## U.S. PATENT DOCUMENTS

3,056,719 10/1962 Webster ..... 162/203

Primary Examiner—Karen M. Hastings

Attorney, Agent, or Firm—Ostrolenk, Faber, Gerb & Soffen, LLP

## [57] ABSTRACT

In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16). They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12). In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).

8 Claims, 2 Drawing Sheets

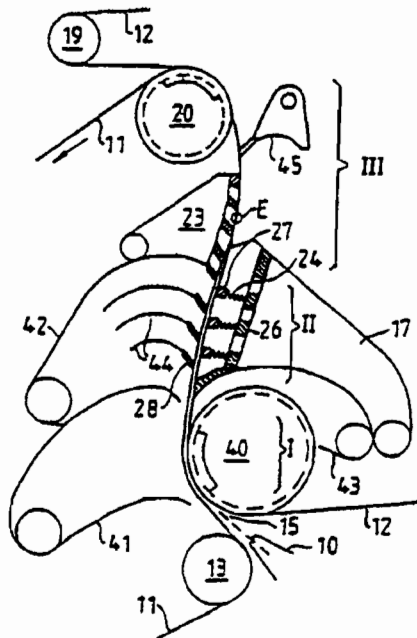


Fig.1

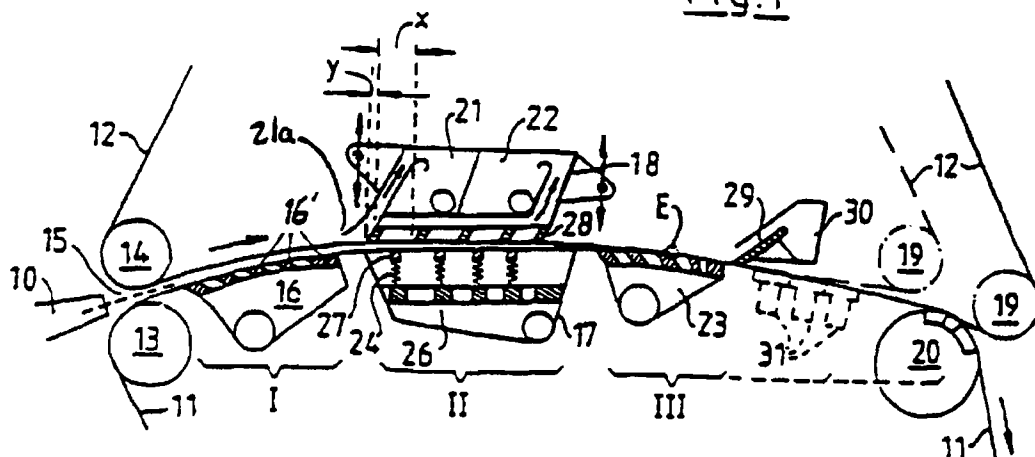


Fig.2

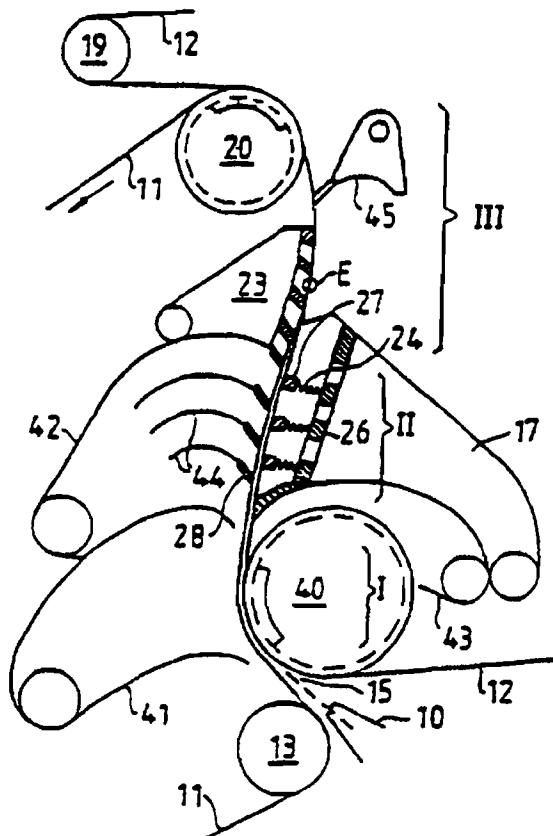


Fig.3

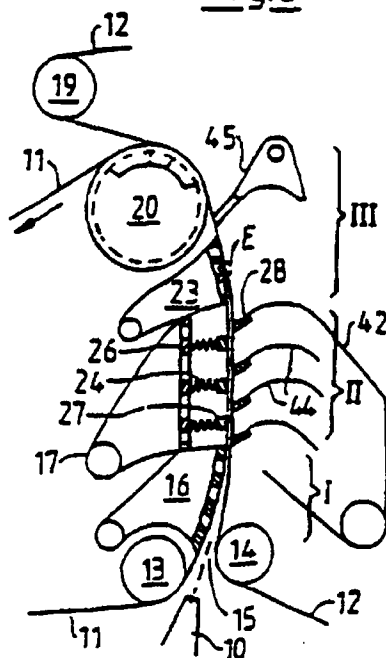




Fig.4

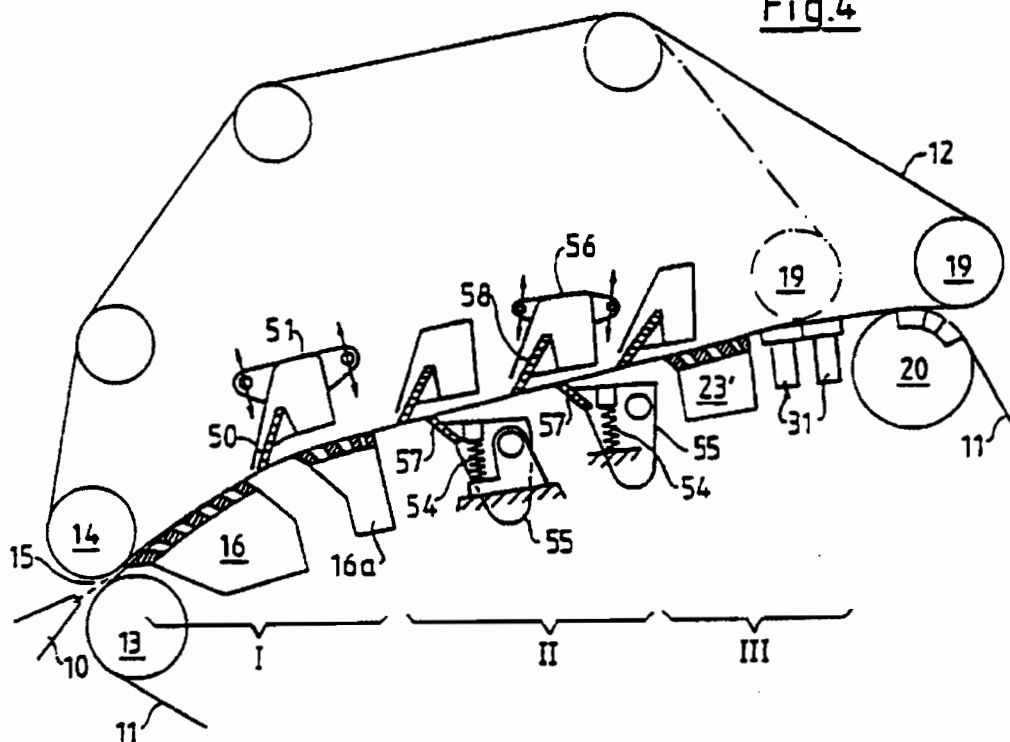
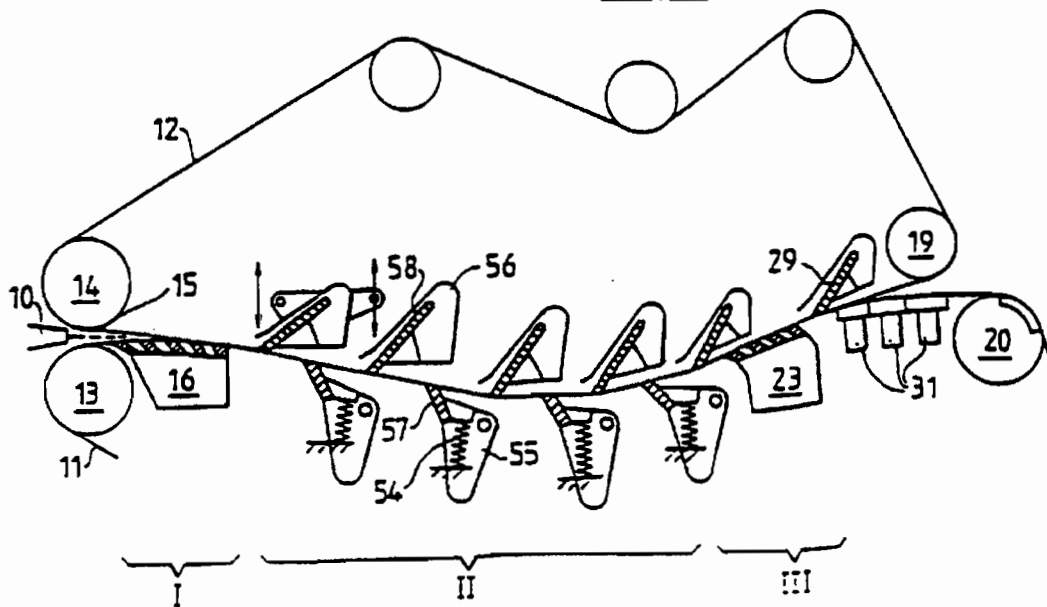


Fig.5



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**TWIN WIRE FORMER****RELATED APPLICATIONS**

This is a continuing application of, and hereby incorporates by reference the entire disclosure of, application Ser. No. 09/023,435, filed Feb. 13, 1998, allowed, which is a continuing application of Ser. No. 08/556,769, filed Nov. 2, 1995, now Pat. No. 5,718,805, which is a continuing application of Ser. No. 08/286,948, filed Aug. 8, 1994, now Pat. No. 5,500,091, which is a continuing application of Ser. No. 08/055,918, filed Apr. 29, 1993, now Pat. No. 5,389,206, which is a continuing application of Ser. No. 07/773,965, filed Nov. 12, 1991, now abandoned, filed as PCT/EP90/01313 on Sept. 8, 1990, now abandoned.

**BACKGROUND OF THE INVENTION**

The present invention relates to a twin-wire former for the production of a fiber web, in particular a paper web, from a fiber suspension. The invention proceeds from the basis of the twin-wire former known from British Patent 1 125 906. The features indicated in the patent include a twin wire former for producing a fiber web and particularly a paper web from a fiber suspension. Two web forming wire belts, in the form of endless loops, travel together to form a twin wire zone. The web travels between and along the path of the wire belts through the twin wire zone. The twin wire zone has three sections and the elements in those three sections are described below. The patent describes features that state, in other words, that the forming of the fiber web from the pulp suspension fed from the headbox takes place exclusively between two wire belts. Thus, there is no so-called single-wire pre-drainage path. In a first section of the twin-wire zone, the two wire belts together form a wedge-shaped inlet slot; a jet of pulp slurry coming from the headbox discharges into it. The jet strikes the two wire belts at a place where they pass over a curved drainage element; in the case of the aforementioned British patent, this is a stationary, curved forming shoe. Its curved wire guide surface is formed of a plurality of strips with drainage slots between them. This forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box). Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation, a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a

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stationary curved forming shoe developed in accordance with the aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

**SUMMARY OF THE INVENTION**

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below in particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with

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respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported, leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duo-former D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duo-former D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

#### BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises

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three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12-upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11 is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag" arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II. Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips



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could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire. There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately

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the value of 8%. This point can, however, also lie, for instance, on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

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Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against support bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and 58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19.

In the embodiment shown in FIG. 5, the twin-wire zone, as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably  $n$  flexibly supported strips 27/57 and  $n+1$  rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number  $n$

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of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.

What is claimed is:

1. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a single forming roll at the start of the path through the twin wire zone;

supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from a headbox directly to the wedge shaped entrance slot of the twin wire zone;

draining water from the fiber suspension by means of the forming roll in order to start the forming of the web from the fiber suspension;

feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming roll between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and over said suction roll, water is drained through the wire belt in contact with said stationary drainage element and with said suction roll; and

maintaining the twin wire zone apart from said single forming roll and said suction roll free of rolls which would deflect the twin wire zone.

2. The method of claim 1, further comprising supplying a vacuum in the area of the second drainage strips.

3. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a single forming roll at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;



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said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; drainage elements in the third section, for being engaged by one of the wire belts as the wire belts travel over the drainage elements, the drainage elements including at least one stationary dewatering element followed by a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone.

4. The twin-wire former of claim 3, further comprising a supplier of vacuum in the area of the second drainage strips.

5. A method for the production of a paper web from a fiber suspension in a twin wire former comprising:

causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, each wire belt forming an endless loop;

feeding the wire belts across a stationary curved forming shoe at the start of the path through the twin wire zone; supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone;

supplying a fiber suspension from the head box directly to the wedge shaped entrance slot of the twin wire zone; draining water from the fiber suspension by means of the forming shoe in order to start the forming of the web from the fiber suspension;

feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming shoe between a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship;

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resiliently supporting the first drainage strips against the first wire belt that the strips contact;

rigidly supporting the second drainage strips against the second wire belt;

feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in the twin wire zone such that as the wire belts travel over the stationary drainage element and the suction roll, water is drained through the wire belt in contact with said stationary drainage element and the suction roll; and

maintaining the twin wire zone apart from said suction roll free of rolls which would deflect the twin wire zone.

6. The method of claim 5, further comprising supplying a vacuum in the area of the second drainage strips.

7. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts which travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone; supports which support the wire belts for forming a wedge shaped entrance slot into the first section;

a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the wire belts through the twin wire zone; in the second section, a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact;

a second strip support which supports the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element followed by a suction roll in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction

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roll having an open surface to enable water to be drained through the wire belt in contact therewith; and the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone.

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8. The twin-wire former of claim 7, further comprising a supplier of vacuum in the area of the second drainage strips.

\* \* \* \* \*

**UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION**

**PATENT NO. :** 5,972,168  
**DATED :** October 26, 1999  
**INVENTOR(S) :** Egelhof, et. al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please correct the first name of the 7<sup>th</sup> inventor's legal representative as follows:  
[75] Else Bück, legal representative

Please add the following missing priority data:  
[30] **Foreign Application Priority Data**  
August 22, 1989 [DE] Germany....P 39 27 597.3

Please correct the Related U.S. Application Data as follows:  
[62] Continuation of application No. 09/023,435, Feb. 13, 1998, which is a continuation of application No. 08/556,769, Nov. 2, 1995, Pat. No. 5,718,805, which is a continuation of application No. 08/286,948, Aug. 8, 1994, Pat. No. 5,500,091, which is a continuation of application No. 08/055,918, April 29, 1993, Pat. No. 5,389,206, which is a continuation of application No. 07/773,965, Nov. 12, 1998, abandoned, filed as application No. PCT/EP90/01313, Aug. 9, 1990.

Signed and Sealed this  
Thirtieth Day of May, 2000

Attest:



Q. TODD DICKINSON

Attesting Officer

Director of Patents and Trademarks

# **EXHIBIT C**

|                           |   |                             |
|---------------------------|---|-----------------------------|
| VOITH PAPER GMBH & CO. KG | : |                             |
|                           | : | Civil Action No. 07-226-jjf |
| Plaintiff,                | : |                             |
|                           | : |                             |
| v.                        | : |                             |
|                           | : |                             |
| JOHNSONFOILS, INC.        | : |                             |
|                           | : |                             |
| Defendant.                | : |                             |

**DEFENDANT JOHNSONFOILS, INC.'S OPENING MARKMAN BRIEF**

**Exhibit C**

**Comparison of U.S. Patent 5,718,805 claim 1**  
**to**  
**U.S. Patent 5,718,805 claims 2 – 5.**

**Exhibit C**

U.S. Patent 5,718,805 (“the ‘805 Patent”) claim 1 is reproduced in its entirety below. The portions of claims 2 -5 that differ with respect to claim 1 are also reproduced. Unless otherwise indicated in the claim 2 – 5 columns, the text of claims 1 – 5 is identical. For clarity, the separate sections of the claims are presented in separate charts.

| The ‘805 Patent<br>Claim 1  | The ‘805 Patent<br>Claim 2 | The ‘805 Patent<br>Claim 3 | The ‘805 Patent<br>Claim 4 | The ‘805 Patent<br>Claim 5 |
|---|----------------------------|----------------------------|----------------------------|----------------------------|
| <p>A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:</p> <p>first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire</p> |                            |                            |                            |                            |



| The '805 Patent<br>Claim 1                                      | The '805 Patent<br>Claim 2 | The '805 Patent<br>Claim 3 | The '805 Patent<br>Claim 4 | The '805 Patent<br>Claim 5 |
|---|----------------------------|----------------------------|----------------------------|----------------------------|
| predrainage zone;<br>each wire belt forming<br>an endless loop; |                            |                            |                            |                            |

The First Section

| The '805 Patent<br>Claim 1  | The '805 Patent<br>Claim 2 | The '805 Patent<br>Claim 3 | The '805 Patent<br>Claim 4 | The '805 Patent<br>Claim 5  |
|---|----------------------------|----------------------------|----------------------------|---|
| the twin wire zone<br>having a first section<br>which includes a first<br>drainage element at<br>the start of the path<br>through the twin wire<br>zone,<br><br>means for supporting<br>the belts for forming a<br>wedge shaped<br>entrance slot into the<br>first section,<br><br>a fiber suspension<br>supplying headbox<br>having an outlet<br>placed and directed<br>for delivering fiber |                            |                            |                            | ...a first<br>section which includes<br>a single first drainage<br>element... |

| The '805 Patent<br>Claim 1  | The '805 Patent<br>Claim 2 | The '805 Patent<br>Claim 3 | The '805 Patent<br>Claim 4 | The '805 Patent<br>Claim 5   |
|---|----------------------------|----------------------------|----------------------------|--|
| suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; |                            |                            |                            | <p>...said<br/>single first drainage element in the first section being a single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the single forming roll being engaged by one of the wire belts for curving the path of the belts around the single forming roll after the entrance of the suspension into the entrance slot;</p> |

The Second Section

| The '805 Patent<br>Claim 1  | The '805 Patent<br>Claim 2       | The '805 Patent<br>Claim 3   | The '805 Patent<br>Claim 4   | The '805 Patent<br>Claim 5   |
|---|----------------------------------|--|--|--|
| <p>the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone</p> <p>in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt;</p> <p>the first strips being shifted in position along the path of the wire belts with respect to the second</p> | <p>...the twin wire zone;...</p> | <p>...the twin wire zone;...</p> <p>... a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt...</p> | <p>...the twin wire zone;...</p> <p>... a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt...</p> | <p>...the twin wire zone;...</p> <p>... a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt...</p> |

| The '805 Patent<br>Claim 1   | The '805 Patent<br>Claim 2              | The '805 Patent<br>Claim 3  | The '805 Patent<br>Claim 4  | The '805 Patent<br>Claim 5 |
|--|---|---|---|----------------------------|
| <p>strips so that the first and second strips are offset and in a non-opposing relationship;</p> <p>first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;</p> <p>second support means supporting the second drainage strips rigidly against the second wire belt;</p> <p>first means for collecting the water drained from the fiber suspension by the most upstream, one of the drainage strips;</p> | <p>...respective ware [sic] belt...</p> | <p>...the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;...</p> <p>[Deleted]</p> | <p>...the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;...</p> <p>[Deleted]</p> | <p>[Deleted]</p>           |

| The '805 Patent<br>Claim 1   | The '805 Patent<br>Claim 2 | The '805 Patent<br>Claim 3 | The '805 Patent<br>Claim 4 | The '805 Patent<br>Claim 5  |
|--|----------------------------|----------------------------|----------------------------|---|
| second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and |                            | [Deleted]                  | [Deleted]                  | [Deleted]<br><br>... and means for supplying a vacuum in the area of the second drainage strips;... |

The Third Section

| The '805 Patent<br>Claim 1  | The '805 Patent<br>Claim 2 | The '805 Patent<br>Claim 3 | The '805 Patent<br>Claim 4 | The '805 Patent<br>Claim 5 |
|---|----------------------------|----------------------------|----------------------------|----------------------------|
| the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone;<br><br>a second drainage element in the third section for being | ...the twin wire zone:...  |                            |                            |                            |

| The '805 Patent<br>Claim 1  | The '805 Patent<br>Claim 2 | The '805 Patent<br>Claim 3  | The '805 Patent<br>Claim 4      | The '805 Patent<br>Claim 5  |
|---|----------------------------|---|---------------------------------|---|
| engaged by one of the wire belts as the wire belts travel over the second drainage element, |                            | ...the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and | ...second drainage element; and | ...the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and |

| The '805 Patent<br>Claim 1   | The '805 Patent<br>Claim 2                          | The '805 Patent<br>Claim 3 | The '805 Patent<br>Claim 4                          | The '805 Patent<br>Claim 5   |
|--|---|----------------------------|---|--|
| the twin wire zone being free of rolls which deflect the twin wire zone. | the twin wire zone being free of any forming rolls. |                            | the twin wire zone being free of any forming rolls. | the twin wire zone apart from said single forming roll being free of rolls which deflect the twin wire zone. |

# **EXHIBIT D**

|                           |   |                             |
|---------------------------|---|-----------------------------|
| VOITH PAPER GMBH & CO. KG | : |                             |
|                           | : | Civil Action No. 07-226-jjf |
| Plaintiff,                | : |                             |
|                           | : |                             |
| v.                        | : |                             |
|                           | : |                             |
| JOHNSONFOILS, INC.        | : |                             |
|                           | : |                             |
| Defendant.                | : |                             |

DEFENDANT JOHNSONFOILS, INC.'S OPENING MARKMAN BRIEF

Exhibit D

Comparison of U.S. Patent 5,718,805 Patent claim 1  
to  
U.S. Patent 5,972, 168 claims 3, 7, 1, and 5.



**Exhibit D**

Claim 1 of U.S. Patent 5,718,805 ("the '805 Patent") is reproduced in its entirety below. Portions of Claims 3 and 7 of U.S. Patent 5,972,168 ("the '168 Patent") that differ with respect to the '805 Patent claim 1 are also reproduced. Unless otherwise indicated in the '168 Patent claim 3 and 7 columns, the text of the '805 Patent claim 1 and the '168 patent claims 3 and 7 is identical.

The '168 Patent method claims 1 and 3 are also reproduced in their entirety and in comparison to the apparatus claims (the '805 Patent claim 1 and the '168 Patent claims 3 and 7).

For clarity, the separate sections of the claims are presented in separate charts.

| <b>The '805 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 3</b>  | <b>The '168 Patent<br/>Claim 7</b>  | <b>The '168 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 5</b>   |
|--|---|---|--|--|
| A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:   | ...<br>first and second web forming wire belts which travel along a path together for forming a twin wire zone... | ...<br>first and second web forming wire belts which travel along a path together for forming a twin wire zone... | A method for the production of a paper web from a fiber suspension in a twin wire former comprising:   | A method for the production of a paper web from a fiber suspension in a twin wire former comprising:   |
| first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the |   |   | causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel | causing first and second web forming wire belts to travel along a path together to form a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel |

| <b>The '805 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 3</b> | <b>The '168 Patent<br/>Claim 7</b> | <b>The '168 Patent<br/>Claim 1</b>  | <b>The '168 Patent<br/>Claim 5</b>  |
|--|------------------------------------|------------------------------------|---|---|
| wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;<br><br>each wire belt forming an endless loop; |                                    |                                    | along the path through the twin wire zone,<br><br>each wire belt forming an endless loop; | along the path through the twin wire zone,<br><br>each wire belt forming an endless loop; |

**The First Section**

| <b>The '805 Patent<br/>Claim 1</b>  | <b>The '168 Patent<br/>Claim 3</b>  | <b>The '168 Patent<br/>Claim 7</b>  | <b>The '168 Patent<br/>Claim 1</b>  | <b>The '168 Patent<br/>Claim 5</b>   |
|---|---|---|---|--|
| the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone,<br><br>means for supporting the belts for forming a wedge shaped entrance slot into the first section, | ...a single forming roll at the start of the path of the wire belts through the twin wire zone<br><br>supports which support the wire belts for forming a wedge shaped entrance slot into the first section;... | ...a stationary curved forming shoe at the start of the path of the wire belts through the twin wire zone;<br><br>supports which support the wire belts for forming a wedge shaped entrance slot into the first section;... | feeding the wire belts across a single forming roll at the start of the path through the twin wire zone;<br><br>supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone; | feeding the wire belts across a stationary curved forming shoe at the start of the path through the twin wire zone;<br><br>supporting the wire belts such as to form a wedge shaped entrance slot into the twin wire zone; |

| The '805 Patent<br>Claim 1  | The '168 Patent<br>Claim 3   | The '168 Patent<br>Claim 7  | The '168 Patent<br>Claim 1  | The '168 Patent<br>Claim 5   |
|---|--|---|---|--|
| <p>a fiber suspension supplying a headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;</p> | <p>... said single forming roll having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the single forming roll being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the single forming roll after the entrance of the suspension into the entrance slot;</p> | <p>... said stationary curved forming shoe having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the wire belts through the twin wire zone, the forming shoe being engaged by one of the wire belts and being arranged for curving the path of both wire belts around the forming shoe after the entrance of the suspension into the entrance slot;</p> | <p>supplying a fiber suspension from a headbox directly to the wedge shaped entrance slot of the twin wire zone;</p> <p>draining water from the fiber suspension by means of the forming roll in order to start the forming of the web from the fiber suspension;</p> | <p>supplying a fiber suspension from the head box directly to the wedge shaped entrance slot of the twin wire zone;</p> <p>draining water from the fiber suspension by means of the forming shoe in order to start the forming of the web from the fiber suspension;</p> |

| The '805 Patent<br>Claim 1 | The '168 Patent<br>Claim 3 | The '168 Patent<br>Claim 7 | The '168 Patent<br>Claim 1 | The '168 Patent<br>Claim 5 |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
|                            |                            |                            |                            |                            |

The Second Section

| The '805 Patent<br>Claim 1  | The '168 Patent<br>Claim 3  | The '168 Patent<br>Claim 7  | The '168 Patent<br>Claim 1   | The '168 Patent<br>Claim 5   |
|---|---|---|--|--|
| the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone   | ... along the path of the wire belts through the twin wire zone;...   | ...along the path of the wire belts through the twin wire zone;   | feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming roll between   | feeding the wire belts with the fiber suspension and the web being generated therebetween downstream of the forming shoe between   |
| in the second section, a plurality of first drainage strips are positioned  | ... a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt;... | ... a plurality of the first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belts; | a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, | a plurality of first drainage strips, which are positioned within the loop of the first wire belt for contacting the first wire belt, and a plurality of second drainage strips, which are positioned within the loop of the second wire belt for contacting the second wire belt, |
| for the first section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for |   |   |  |  |



| The '805 Patent<br>Claim 1   | The '168 Patent<br>Claim 3   | The '168 Patent<br>Claim 7   | The '168 Patent<br>Claim 1   | The '168 Patent<br>Claim 5   |
|--|--|--|--|--|
| contacting the second wire belt;   |  |  |  |  |
| the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; |  |  | the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; | the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; |
| first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;   | ...<br>a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact; | ...<br>a first strip support which resiliently supports the first drainage strips against the first wire belt that the first strips contact; | resiliently supporting the first drainage strips against the first wire belt that the strips contact;  | resiliently supporting the first drainage strips against the first wire belt that the strips contact;  |
| second support means supporting the second drainage strips rigidly against the second wire belt;   | a second strip support which supports the second drainage strips rigidly against the second wire belt;                                       | a second strip support which supports the second drainage strips rigidly against the second wire belt;...                                    | rigidly supporting the second drainage strips against the second wire belt;  | rigidly supporting the second drainage strips against the second wire belt;  |
| first means for collecting the water drained from the fiber  | [Deleted]  | [Deleted]  |  |  |

| <b>The '805 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 3</b> | <b>The '168 Patent<br/>Claim 7</b> | <b>The '168 Patent<br/>Claim 1</b> | <b>The '168 Patent<br/>Claim 5</b> |
|--|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| suspension by the most upstream, one of the drainage strips;<br><br>second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and | [Deleted]                          | [Deleted]                          |                                    |                                    |

**The Third Section**

| <b>The '805 Patent<br/>Claim 1</b>  | <b>The '168 Patent<br/>Claim 3</b>                                   | <b>The '168 Patent<br/>Claim 7</b>                                  | <b>The '168 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 5</b>   |
|---|--|---|--|--|
| the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone;<br><br>a second drainage element in the third section for being | ... drainage elements in the third section, for being engaged by one | ... a stationary drainage element followed by a suction roll in the | feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in | feeding the wire belts with the web therebetween downstream of said drainage strips across a stationary drainage element and then across a suction roll in |

|   |   |   |  |  |
|---|---|---|--|--|
| <b>The '805 Patent<br/>Claim 1</b>  | <b>The '168 Patent<br/>Claim 3</b>  | <b>The '168 Patent<br/>Claim 7</b>  | <b>The '168 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 5</b>   |
| engaged by one of the wire belts as the wire belts travel over the second drainage element, | of the wire belts as the wire belts travel over the drainage elements, including at least one stationary dewatering element followed by a suction roll and having an open surface to enable water to be drained through the wire belt in contact therewith; and | third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element and said suction roll, the stationary drainage element and said suction roll having an open surface to enable water to be drained through the wire belt in contact therewith; and | the twin wire zone such that as the wire belts travel over the stationary drainage element and over said suction roll, water is drained through the wire belt in contact with said stationary drainage element and with said suction roll; and | the twin wire zone such that as the wire belts travel over the stationary drainage element and the suction roll, water is drained through the wire belt in contact with said stationary drainage element and the suction roll; and |

|  |  |   |  |   |
|--|--|---|--|---|
| <b>The '805 Patent<br/>Claim 1</b>                                       | <b>The '168 Patent<br/>Claim 3</b>   | <b>The '168 Patent<br/>Claim 7</b>  | <b>The '168 Patent<br/>Claim 1</b>   | <b>The '168 Patent<br/>Claim 5</b>  |
| the twin wire zone being free of rolls which deflect the twin wire zone. | the twin wire zone apart from said single forming roll and said suction roll being free of rolls which deflect the twin wire zone. | the twin wire zone apart from said suction roll being free of rolls which deflect the twin wire zone. | maintaining the twin wire zone apart from said single forming roll and said suction roll free of rolls which would deflect the twin wire zone. | maintaining the twin wire zone apart from said suction roll free of rolls which would deflect the twin wire zone. |



# **EXHIBIT E**

*The Voice of Authority*

# Merriam Webster's Collegiate<sup>®</sup> Dictionary

TENTH EDITION

America's foremost dictionary publisher continues its  
150-year tradition of excellence with this new edition of  
America's best-selling dictionary.



# Merriam- Webster's Collegiate<sup>®</sup> Dictionary

TENTH EDITION

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## 452 foil • follower

**foil** *n* (15c) 1 *archaic*: DEFEAT 2 *archaic*: the track or trail of an animal

**foil** *n* [origin unknown] (1594) 1: a light fencing sword having a usu. circular guard and a flexible blade of rectangular section tapering to a blunted point — compare *épée*, *saber* 2: the art or sport of fencing with the foil — often used in pl.

**foil** *vt* (1611) 1: to back or cover with foil 2: to enhance by contrast

**foiled** *\foi-(ə)ld\ adj* (1835): ornamented with foils (a ~ arch)

**foils-man** *\foi-(ə)lz-man\ n* (1927): one who fences with a foil

**foin** *\foin\ vi* [ME, fr. *foin* fork for spearing fish, fr. MF *foisne*] (14c) *archaic*: to thrust with a pointed weapon: LUNGE

**foin** *n* (15c) *archaic*: a pass in fencing: LUNGE

**foison** *\foi-zən\ n* [ME *foisoun*, fr. MF *foison*, fr. L *fusion*, *fusio* pouring, effusion — more at *FUSION*] (14c) 1 *archaic*: rich harvest 2 *chiefly Scot*: physical energy or strength 3 pl, obs: RESOURCES

**foist** *\foist\ vt* [Prob. fr. obs. D *vuisten* to take into one's hand, fr. MD *vuysten*, fr. *vuyst* fist; akin to OE *fyst* fist] (ca. 1587) 1 a: to introduce or insert surreptitiously or without warrant b: to force another to accept esp. by stealth or deceit 2: to pass off as genuine or worthy (costly and valueless products on the public — Jonathan Spivak)

**fo-la-cin** *\fo-lə-sən\ n* [fo-läc + -in] (1949): FOLIC ACID

**fo-late** *\fo-lät\ n* (1951): FOLIC ACID

**fold** *\fold\ n* [ME, fr. OE *fald*; akin to OS *fald* enclosure] (bef. 12c) 1: an enclosure for sheep 2 a: a flock of sheep b: a group of people or institutions that share a common faith, belief, activity, or enthusiasm

**fold** *vt* (bef. 12c): to pen up or confine (as sheep) in a fold

**fold** *vb* [ME, fr. OE *faldan*; akin to OHG *faldan* to fold, Gk *diplosis* twofold] *v* (bef. 12c) 1: to lay one part over another part of (~ a letter) 2: to reduce the length or bulk of by doubling over (~ a tent) 3: to clasp together: ENTWINE (~ the hands) 4: to clasp or enwrap closely: EMBRACE 5: to bend (as a layer of rock) into folds 6 a: to incorporate (a food ingredient) into a mixture by repeated gentle overturnings without stirring or beating b: to incorporate closely 7 a: to concede defeat by withdrawing (one's cards) from play (as in poker) b: to bring to an end ~ *vi* 1: to become doubled or pleated 2: to fail completely: COLLAPSE *esp*: to go out of business 3: to fold one's cards (as in poker) — **fold-able** *\föld-ə-bəl\ adj*

**fold** *n* (13c) 1: a part doubled or laid over another part: PLEAT 2: something that is folded together or that enfolds 3 a: a bend or flexure produced in rock by forces operative after the depositing or consolidation of the rock b *chiefly Brit*: an undulation in the landscape 4: a margin apparently formed by the doubling upon itself of a flat anatomical structure (as a membrane) 5: a crease made by folding something (as a newspaper)

**fold** *\fold, föld\ suffix* [ME, fr. OE *-feald*; akin to OHG *-falt*-fold, L *-plex*, *-plus*, OE *fealdan*] 1: multiplied by (a specified number): times — in adjectives (as *sixfold* increase) and adverbs (repay you *tenfold*) 2: having (so many) parts (threefold aspect of the problem)

**fold-away** *\föld-ə-wä\ adj* (1948): designed to be folded for storage or portability (~ doors) (~ bed) (~ table)

**fold-boat** *\föld-(b)öt\ n* [trans. of G *Faltboot*] (1938): a small collapsible canoe made of rubberized sailcloth stretched over a framework

**fold-er** *\föld-dər\ n* (1552) 1: one that folds 2: a folded printed circular 3: a folded cover or large envelope for holding or filing loose papers

**fol-de-rol** *\fä-də-räl\ n* [fol-de-rol, a nonsense refrain in songs] (1820) 1: a useless ornament or accessory: TRIFLE 2: NONSENSE

**fold-ing** *\föld-dip\ adj* (15c): capable of being folded into a more compact shape (~ chairs) (~ door)

**folding money** *n* (ca. 1930): PAPER MONEY

**fold-out** *\föld-(d)äut\ n*, often *attrib* (1950): a folded leaf in a publication (as a book) that is larger in some dimension than the page (a ~ map)

**fo-li-a-ceous** *\fo-lē-ä-shəs\ adj* [L *foliaceus*, fr. *folium* leaf + *-aceus* -aceous] (1658): of, relating to, or resembling an ordinary green leaf as distinguished from a modified leaf (as a petal, bract, or scale)

**fo-li-age** *\fo-lē-ij\ n* — *fo-li-j*, *fo-li-ij\ n* [MF *fuellage*, fr. *feuille* leaf — more at *FOLL*] (1598) 1: a representation of leaves, flowers, and branches for architectural ornamentation 2: the aggregate of leaves of one or more plants 3: a cluster of leaves, flowers, and branches — **fo-li-ated** *\fo-lē-ijd\ also -lyjd; -fo-lījd, -fo-lī-adj*

**usage** The dissyllabic pronunciation, *\fo-līj*, is very common. Some commentators insist that *foliage* requires a trisyllabic pronunciation because of its spelling, but words of a similar pattern such as *carriage* and *marriage* do not fall under their prescription. The pronunciation *\fo-līj* is disapproved because it suggests the transposition of the *l* and *i* in the spelling. It is not as common as *\fo-līj* and may be associated with the nonstandard spelling *foliage*.

**foliage plant** *n* (1862): a plant grown primarily for its decorative foliage

**fo-li-ar** *\fo-lē-ər\ adj* [F *foliaire*, fr. L *folium* leaf + F *-aire* -ar] (ca. 1859): of, relating to, or applied to leaves (~ sprays)

**fo-li-ate** *\fo-lē-ät, -ät\ adj* [L *foliatus* leafy, fr. *folium* leaf — more at *BLADE*] (ca. 1658) 1: shaped like a leaf (a ~ sponge) 2: FOLIATED

**fo-li-at-ed** *\fo-lē-ät\ adj* (1650) 1: composed of or separable into layers (a ~ rock) 2: ornamented with foils or a leaf design

**fo-li-a-tion** *\fo-lē-ä-shən\ n* (ca. 1623) 1 a: the process of forming into a leaf b: the state of being in leaf c: VERNATION 2: the numbering of the leaves of a manuscript or early printed book 3 a: ornamentation with foliage b: a decoration resembling a leaf 4: the enrichment of an opening by foils 5: foliated texture

**fo-li-cid** *\fo-līk\ n* [L *folium*] (1941): a crystalline vitamin C<sub>19</sub>H<sub>19</sub>N<sub>7</sub>O<sub>6</sub> of the B complex that is used esp. in the treatment of nutritional anemias — called also *pteroylglutamic acid*

**fo-li-ä-deux** *\fo-lē-ä-dē, -ä-lä-ä-dä(r)\ n* [F, lit., double madness] (ca. 1892): the presence of the same or similar delusional ideas in two persons closely associated with one another

**fo-lio** *\fo-lē-ō\ n*, pl **fo-li-ös** [ME, fr. L, abl. of *folium*] (1447) 1 a: a leaf esp. of a manuscript or book b: a leaf number c: a page number d: an identifying reference in accounting used in posting 2 a: a sheet of paper folded once b: a case or folder for loose papers 3 a: the size of a piece of paper cut two from a sheet; also: paper or a page of this size b: a book printed on folio pages c: a book of the

largest size 4: a certain number of words taken as a unit or division in a document for purposes of measurement or reference

**folio** *vi* (1858): to put a serial number on each leaf or page of **fo-li-ose** *\fo-lē-ös\ adj* [L *foliosus* leafy] (1758): having a flat, thin and usu. lobed thallus attached to the substratum (~ lichens) — compare *CRUSTOSE*, *FRUTICOSE*

**folk** *\fölk\ n*, pl **folk** or **folks** [ME, fr. OE *folc*; akin to OHG *folc* people] (bef. 12c) 1 *archaic*: a group of kindred tribes forming a nation

2: the great proportion of the members of a people that determines the group character and that tends to preserve its characteristic form of civilization and its customs, arts and crafts, legends, traditions, and superstitions from generation to generation 3 pl: a certain kind, class, or group of people (old ~s) (just plain ~) (country ~) (media ~) 4 *folks* pl: people generally 5 *folks* pl: the persons of one's own family; *esp*: PARENTS

**folk** *adj* (bef. 12c) 1: originating or traditional with the common people of a country or region and typically reflecting their lifestyle (hero) (~ music) 2: of or relating to the common people or to the study of the common people (~ sociology)

**folk etymology** *n* (1882): the transformation of words so as to give them an apparent relationship to other better-known or better understood words (as in the change of Spanish *cucaracha* to English *cockroach*)

**folk-ie** also **folky** *\fö-kē\ n*, pl **folkies** (1965): a folk singer or instrumentalist

**folkie** or **folky** *adj* (1965): of or relating to folk music

**folk-ish** *\fö-kish\ adj* (1938): FOLKLIKE — **folk-ish-ness** *n*

**folk-life** *\fölk-lif\ n* (1864): the traditions, activities, skills, and products (as handicrafts) of a particular people or group

**folk-like** *\fö-klik\ adj* (1939): having a folk character

**folk-lore** *\fö-k-lör, -klör\ n* (1846) 1: traditional customs, tales, sayings, dances, or art forms preserved among a people 2: a branch of knowledge that deals with folklore 3: an often unsupported notion, story, or saying that is widely circulated — **folk-lore-ic** *\fö-k-lör-ik\ adj* — **folk-lore-ish** *\fö-k-lör-ish\ adj* — **folk-lore-ist** *\fö-k-lör-ist\ n* — **folk-lore-istic** *\fö-k-lör-istik, -klör-adj*

**folk mass** *n* (1966): a mass in which traditional liturgical music is replaced by folk music

**folk medicine** *n* (1878): traditional medicine as practiced nonprofessionally esp. by people isolated from modern medical services and usually involving the use of plant-derived remedies on an empirical basis

**folk-moot** *\fölk-müt\ or folk-mote* *\möt\ n* [alter. of OE *folcmōt* *folcgemōt*, fr. *folc* people + *mōt*, *gemōt* meeting — more at *MOOT*] (bef. 12c): a general assembly of the people (as of a shire) in early England

**folk-singer** *\fölk-sin-ər\ n* (1884): one who sings folk songs or songs in a style associated with folk songs — **folk-sing-ing** *\fölk-sin-ig\ n*

**folk song** *n* (1847): a traditional or composed song typically characterized by stanzaic form, refrain, and simplicity of melody

**folksy** *\fölk-sē\ adj* **folks-i-er**; -*est* (1852) 1: SOCIABLE, FRIENDLY 2: informal, casual, or familiar in manner or style (~ humor) — **folks-i-ly** *\fölk-sē-lē\ adv* — **folks-i-ness** *\fölk-sē-nəs\ n*

**folk-tale** *\fölk-täl\ n* (1852): a characteristically anonymous, timeless, and placeless tale circulated orally among a people

**folk-way** *\fölk-wä\ n* (ca. 1906): a mode of thinking, feeling, or acting common to a given group of people; *esp*: a traditional social custom

**fol-li-cle** *\fä-lī-kəl\ n* [NL *folliculus*, fr. L, dim. of *follicis* bag — more at *FOLL*] (1646) 1 a: a small anatomical cavity or deep narrow-mouthed depression b: a small lymph node c: a vesicle in the mammalian ovary that contains a developing egg surrounded by a covering of cells; *esp*: GRAAFIAN FOLLICLE 2: a dry dehiscent one-celled many-seeded fruit (as of the milkweed) that has a single carpel and opens along one suture — **fol-li-cu-lar** *\fö-lī-kyä-lər, -ä-l\ adj*

**follicle mite** *n* (1925): any of several minute mites (genus *Demodex*) parasitic in hair follicles

**follicle-stimulating hormone** *n* (ca. 1943): a hormone produced by the anterior lobe of the pituitary gland that stimulates the growth of the ovum-containing follicles in the ovary and activates sperm-forming cells

**fol-li-cu-li-tis** *\fö-lī-kyä-'lī-tis\ n* [NL, fr. *folliculus* + *-itis*] (ca. 1860): inflammation of one or more follicles esp. of the hair

**fol-low** *\fä-(l)ö, -löl-(w)\ vb* [ME *folwen*, fr. OE *folgian*; akin to OHG *folgēn* to follow] *v* (bef. 12c) 1: to go, proceed, or come after (~ the guide) 2 a: to engage in as a calling or way of life: PURSUE (wheat-growing is generally ~ed here) b: to walk or proceed along (~ a path) 3 a: to be or act in accordance with (~ directions) b: to accept as authority: OBEY (~ed his conscience) 4 a: to pursue in an effort to overtake b: to seek to attain (~ knowledge) 5: to come into existence or take place as a result or consequence of (disaster ~ed the blunder) 6 a: to come or take place after in time, sequence, or order b: to cause to be followed (~ed dinner with a liqueur) 7 or order b: to copy after: IMITATE 8 a: to watch steadily (~ed the flight of the ball) b: to keep the mind on (~ a speech) c: to attend closely to: keep abreast of (~ed his career with interest) d: to understand the sense or logic of (as a line of thought) ~ *vi* 1: to go or come after a person or thing in place, time, or sequence 2: to result or occur as a consequence, effect, or inference — **as follows**: as comes next — used impersonally — **follow one's nose** 1: to go in a straight or obvious course 2: to proceed without plan or reflection: obey one's instincts — **follow suit** 1: to play a card of the same suit as the card led 2: to follow an example set

**syn** FOLLOW, SUCCEED, ENSUE. SUPERVENE mean to come after something or someone. FOLLOW may apply to a coming after in time, position, or logical sequence (speeches followed the dinner). SUCCEED implies a coming after immediately in a sequence determined by natural order, inheritance, election, or laws of rank (she succeeded her father as head of the business). ENSUE commonly suggests a logical consequence or naturally expected development (after the talk a general discussion ensued). SUPERVENE suggests the following or beginning of something unforeseen or unpredictable (supervening events brought unhappiness to him). **syn** see in addition CHASE

**follow** *n* (1870) 1: the act or process of following 2: forward spin given to a ball by striking it above center — compare *DRAW*, *ENGLISH*

**fol-low-er** *\fä-lä-wər\ n* (bef. 12c) 1 a: one in the service of another: RETAINER b: one that follows the opinions or teachings of another

c: one that imit added to the first part that receive at the bottom of insertion into the

**syn** FOLLOWER. loyalty and sup attach themself

attachment (ac giance to the t dth) PARTISAN

one of the Pres

**follow-er-ship** *n* willingness to

**follow-ing** *\fä -day\ 2: list*

**following** *n* (15 following prep served)

**follow-on** *\fä -tion\ that follow progression — 1*

**follow out** *vt* (EX CARRY OUT, EX

**follow shot** *n* (ing the cue ball striking the obj

**follow-through** *n* the movement c

**follow-through** *n* an instance of l

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# **EXHIBIT F**



|  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
|--|---|-------------------------|------------------|-----------------------|--------------|--------------------------|---|-----------------------|------------------|---------------|--------------|---------------|---------------------|-----------------------|---------------------------|---|-------|-----|---|----|---|------------|----------|
| 02/556769  |   | 162-301                 |                  | ISSUE CLASSIFICATION  |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| UTILITY SERIAL NUMBER 02/556769  |   | PATENT DATE FEB 17 1998 |                  | PATENT NUMBER 5718805 |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| SERIAL NUMBER 08/556,769   |   | FILING DATE 11/02/95    |                  | CLASS 162             |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| SUBCLASS 301.000   |   | 173                     |                  | AMINER                |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| <p>APPLICANTS DIETER EGGELHOF, HEIDENHEIM, FED REP GERMANY; KLAUS HENSELER, HEIDENHEIM, FED REP GERMANY; WERNER KADE, NEENAH, WI; ALBRECHT MEINECKE, HEIDENHEIM, FED REP GERMANY; WILHELM WANKE, HEIDENHEIM, FED REP GERMANY; HANS-JURGEN WULZ, HEIDENHEIM, FED REP GERMANY; RUDOLF BUCK, HEIDENHEIM, FED REP GERMANY, DECEASED; BY ELSE BUCK, HEIDENHEIM, FED REP GERMANY, LEGAL REPRESENTATIVE.</p>  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| <p>**CONTINUING DATA*****</p> <p>VERIFIED THIS APPLN IS A CON OF 08/286,948 08/08/94 PAT 5,500,091</p> <p>WHICH IS A CON OF 08/055,918 04/29/93 PAT 5,389,206</p> <p>WHICH IS A CON OF 07/773,965 11/12/91 ABN</p> <p>**FOREIGN/PCT APPLICATIONS*****</p> <p>VERIFIED FED REP GERMANY P 39 27 597.3 08/22/89</p> <p>PCT PCT/EP90/01313 09/08/90</p>  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| <p>NOTE-DISCLAIMER</p> <p>The term of this patent shall not extend beyond the expiration date of Pat. No. 5500091</p>  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| FOREIGN FILING LICENSE GRANTED 09/07/96  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| <table border="1"> <tr> <td>Foreign priority claimed</td> <td>yes <input checked="" type="checkbox"/> no <input type="checkbox"/></td> <td>AS FILED</td> <td>STATE OR COUNTRY</td> <td>SHEETS DRWGS.</td> <td>TOTAL CLAIMS</td> <td>INDEP. CLAIMS</td> <td>FILING FEE RECEIVED</td> <td>ATTORNEY'S DOCKET NO.</td> </tr> <tr> <td>35 USC 119 conditions met</td> <td>yes <input checked="" type="checkbox"/> no <input type="checkbox"/></td> <td>FILED</td> <td>DEX</td> <td>2</td> <td>30</td> <td>3</td> <td>\$1,122.00</td> <td>P/14-363</td> </tr> </table> |   |                         |                  |                       |              | Foreign priority claimed | yes <input checked="" type="checkbox"/> no <input type="checkbox"/> | AS FILED              | STATE OR COUNTRY | SHEETS DRWGS. | TOTAL CLAIMS | INDEP. CLAIMS | FILING FEE RECEIVED | ATTORNEY'S DOCKET NO. | 35 USC 119 conditions met | yes <input checked="" type="checkbox"/> no <input type="checkbox"/> | FILED | DEX | 2 | 30 | 3 | \$1,122.00 | P/14-363 |
| Foreign priority claimed   | yes <input checked="" type="checkbox"/> no <input type="checkbox"/> | AS FILED                | STATE OR COUNTRY | SHEETS DRWGS.         | TOTAL CLAIMS | INDEP. CLAIMS            | FILING FEE RECEIVED   | ATTORNEY'S DOCKET NO. |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| 35 USC 119 conditions met  | yes <input checked="" type="checkbox"/> no <input type="checkbox"/> | FILED                   | DEX              | 2                     | 30           | 3                        | \$1,122.00  | P/14-363              |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| <p>OSTROLENK FABER GERB &amp; SOFFEN</p> <p>1180 AVENUE OF THE AMERICAS</p> <p>NEW YORK NY 10036-8403</p>  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| TWIN WIRE FORMER   |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| U.S. DEPT. OF COMMERCE PAT. & TM. PTO-436L (Rev. 1)  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| PARTS OF APPLICATION FILED SEPARATELY  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| NOTICE OF ALLOWANCE MAILED   |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| 2/25/97  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| ISSUE FEE  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| Amount Due 1290 Date Paid 7/28/97  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| FORM PTO-1267 U.S. Department of Commerce Patent and Trademark Office  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| DISCLAIMER LABEL   |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| Application No. 08/556769  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| A terminal disclaimer has been entered and recorded under 35 U.S.C. 253 in this file.  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| DO NOT DESTROY   |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |
| <p>CLAIMS ALLOWED</p> <p>Total Claims 5</p> <p>Print Claims 2/2</p> <p>DRAWING</p> <p>Sheets Drwg. 2 Figs. Drwg. 5 Print Figs. 2</p> <p>ISSUE BATCH NUMBER 28</p> <p>PREPARED FOR ISSUE</p> <p>WARNING: The information disclosed herein may be restricted. Unauthorized disclosure may be prohibited by the United States Code, Title 35, Sections 122, 181 and 368. Possession outside the U.S. Patent &amp; Trademark Office is restricted to authorized employees and contractors only.</p>  |   |                         |                  |                       |              |                          |   |                       |                  |               |              |               |                     |                       |                           |   |       |     |   |    |   |            |          |



## PATENT APPLICATION



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## CONTENTS

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|---------|------------------------------------|----------------|
|         | 1. Application papers.             |                |
|         | 2. <i>Unre. model</i>              | 21296          |
|         | 3. <i>pre-amendment A</i>          | 2-12-96/9-9-96 |
|         | 4. <i>g.o.n / dec / surcharge</i>  | 6-14-96        |
|         | 5. <i>Corrected filing receipt</i> |                |
| 9/25/96 | 6. <i>[Redacted]</i>               | 11-14-96       |
|         | 7. <i>[Redacted]</i>               |                |
|         | 8. <i>[Redacted]</i>               |                |
|         | 9. <i>Terminal Disclaimer</i>      | 3-7-97         |
|         | 10. <i>Interim</i>                 | 4-28-97        |
| 4-25-97 | 11. <i>Exr Am A/C</i>              | 4-25-97        |
|         | 12. <i>Amend D (NE 312)</i>        | 6-20-97        |
| 7-18-97 | 13. <i>Letter of Entry</i>         |                |
|         | 14. <i>PTO Grant NOV 14 1997</i>   |                |
|         | 15. <i>PTO Grant FEB 17 1998</i>   |                |
|         | 16. <i>Prior Art</i>               | 12-15-98       |
|         | 17.                                |                |
|         | 18.                                |                |
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| POSITION    | ID NO. | DATE     |
|-------------|--------|----------|
| CLASSIFIER  | 20     | 1-6      |
| EXAMINER    | E470   | 2/2/98   |
| TYPIST      | 343    | 6/25/98  |
| VERIFIER    |        |          |
| CORPS CORR. |        |          |
| SPEC. HAND  | 491    | 10-24-96 |
| FILE MAINT. | 452    | 2-8-96   |
| DRAFTING    |        |          |

## INDEX OF CLAIMS

| Claim | Date     |
|-------|----------|
| 1     | 10/14/97 |
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SYMBOLS

✓ Rejected

— Allowed

(Through numeral) Canceled

+ Restricted

N Non-elected

I Interference

A Appeal

O Disposed

| Claim | Date |
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**SEARCHED**

| Class | Sub.                                   | Date                     | Exmr.      |
|-------|--|--------------------------|------------|
| 162   | 203<br>300<br>301<br>303<br>348<br>352 | 9-96<br>to date<br>4.9.7 | kmh<br>kmh |


**SEARCH NOTES**

|                  | Date | Exmr. |
|------------------|------|-------|
| vid parent files | 9-96 | kmh   |

**INTERFERENCE SEARCHED**

| Class | Sub.  | Date  | Exmr. |
|-------|-------|-------|-------|
| 162   | above | 4.9.7 | kmh   |

(RIGHT OUTSIDE)

|   |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
|---|--|---|--|-------------------------|--|-------------------------|--|-----------------------------------|--|---------------------------------|--|------------------------|--|--|--|
| BAR CODE LABEL  |  |  |  |                         |  |                         |  | U.S. PATENT APPLICATION           |  |                                 |  |                        |  |  |  |
| SERIAL NUMBER<br>08/556,769   |  |   |  | FILING DATE<br>11/02/95 |  |                         |  | CLASS<br>140                      |  |                                 |  | GROUP ART UNIT<br>3201 |  |  |  |
| APPLICANT<br><br>DIETER EGELHOF, HEIDENHEIM, FED REP GERMANY; KLAUS HENSELER, HEIDENHEIM, FED REP GERMANY; WERNER KADE, NEENAH, FED REP GERMANY; ALBRECHT MEINECKE, HEIDENHEIM, FED REP GERMANY; WILHELM WANKE, HEIDENHEIM, FED REP GERMANY; HANS-JURGEN WULZ, HEIDENHEIM, FED REP GERMANY; RUDOLF BUCK, HEIDENHEIM, FED REP GERMANY, DECEASED; BY ELSE BUCK, HEIDENHEIM, FED REP GERMANY, LEGAL REPRESENTATIVE.<br><br>**CONTINUING DATA*****<br>VERIFIED THIS APPLN IS A CON OF 08/286,948 08/08/94 PAT 5,500,091<br>WHICH IS A CON OF 08/055,918 04/29/93 PAT 5,389,206<br>WHICH IS A CON OF 07/773,965 11/12/91<br><br>**FOREIGN/PCT APPLICATIONS*****<br>VERIFIED FED REP GERMANY P 39 27 597.3 08/22/89 |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
|   |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
| STATE OR COUNTRY<br>DEX   |  | SHEETS DRAWING<br>2   |  | TOTAL CLAIMS<br>30      |  | INDEPENDENT CLAIMS<br>3 |  | FILING FEE RECEIVED<br>\$1,122.00 |  | ATTORNEY DOCKET NO.<br>P/14-363 |  |                        |  |  |  |
| ADDRESS<br>OSTROLENK FABER GERB & SOFFEN<br>1180 AVENUE OF THE AMERICAS<br>NEW YORK NY 10036-8403   |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
| TITLE<br>TWIN WIRE FORMER   |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
| This is to certify that annexed hereto is a true copy from the records of the United States Patent and Trademark Office of the application which is identified above.   |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
| By authority of the COMMISSIONER OF PATENTS AND TRADEMARKS  |  |   |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |
| Date  |  | Certifying Officer  |  |                         |  |                         |  |                                   |  |                                 |  |                        |  |  |  |

PATENT APPLICATION SERIAL NO ~~08~~/556769

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE  
FEE RECORD SHEET

310 CS 12/15/95 08556732  
1 101 970.00 CR P/14-363



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Hon. Commissioner of Patents and Trademarks  
Washington, DC 20231

OFPS File No. : P/14-363 1-00  
Inventor : Rudolf BUCK et al.  
Title : TWIN WIRE FORMER  
Assignee : J.M. Voith GmbH

Enclosed herewith please find the following documents in the above-identified application for United States Letters Patent:

XX Abstract  
13 Pages of Specification  
30 Numbered Claims Calculated as 30 Claims for Fee Purposes  
2 Sheets of Drawing Containing Figures 1 to 5.  
Declaration and Power of Attorney  
XX Priority is Claimed under 35 U.S.C. §119:  
Convention Date August 22, 1989 for German Appln. S.N. P 39 27 597.3  
Certified Priority Application  
Verified Statement Claiming Small Entity Status under 37 C.F.R. §1.27.  
Assignment  
XX Return-Addressed Post Card  
OFPS Check No. 5327, which includes the fee of \$970.00, calculated as follows:

|  |           |
|--|-----------|
| Basic Filing Fee:  | \$ 750.00 |
| Additional Filing Fees:                                  |           |
| Total Number of Claims in Excess of 20, times \$22:      | 220.00    |
| Number of Independent Claims in Excess of 3, times \$78: |           |
| One or More Multiple Dependent Claims: Total \$250:      |           |
| Total Filing Fees or                                     |           |
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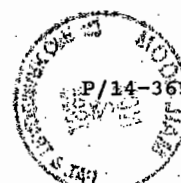
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ABSTRACT OF THE DISCLOSURE

5  
KMA  
In a twin-wire former for the production of a paper web, two wire belts (11 and 12) together form a twin-wire zone which is divided into three sections (I, II and III). In the first section (I) the two wires (11, 12) travel over a curved forming shoe (16) <sup>or a forming roll (40)</sup>. They form there a wedge-shaped inlet slot (15) with which a headbox (10) is directly associated. In the second section (II), several resiliently supported strips (27) rest against the lower wire (11) and between each of said strips (27) a rigidly mounted strip (28) rests against the upper wire (12).  
10 In the third section (III) both wire belts (11, 12) pass over another curved forming shoe (23).





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TWIN WIRE FORMER

RELATED APPLICATIONS

This is a continuing application of, and hereby  
 5 incorporates by reference the entire disclosure of, application  
 Serial No. 08/286,948, filed August 8, 1994 now <sup>U.S. Patent No. 5,300,091</sup> pending, which is  
 a continuing application Serial No. 08/055,918, filed April 29,  
 1993, issued February 14, 1995 as Patent 5,389,206, which is a  
 continuing application Serial No. 07/773,965, filed November 12,  
 10 1991, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a twin-wire former for  
 the production of a fiber web, in particular a paper web, from a  
 fiber suspension. The invention proceeds from the basis of the  
 15 twin-wire former known from British Patent 1 125 906. The  
 features indicated in the patent include a twin wire former for  
 producing a fiber web and particularly a paper web from a fiber  
 suspension. Two web forming wire belts, in the form of endless  
 loops, travel together to form a twin wire zone. The web travels  
 20 between and along the path of the wire belts through the twin  
 wire zone. The twin wire zone has three sections and the elements  
 in those three sections are described below. The patent describes  
 features that state, in other words, that the forming of the  
 fiber web from the pulp suspension fed from the headbox takes  
 25 place exclusively between two wire belts. Thus, there is no  
 so-called single-wire pre-drainage path. In a first section of  
 the twin-wire zone, the two wire belts together form a  
 wedge-shaped inlet slot; a jet of pulp slurry coming from the  
 headbox discharges into it. The jet strikes the two wire belts at  
 30 a place where they pass over a curved drainage element; in the  
 case of the aforementioned British patent, this is a stationary,  
 curved forming shoe. Its curved wire guide surface is formed of a  
 plurality of strips with drainage slots between them. This

forming shoe is followed (in a second section of the twin-wire zone) by a drainage strip arranged in the other wire loop and, behind the latter, by a drainage strip arranged in the first-mentioned wire loop (and formed by a first suction box).  
5 Finally, in a third section of the twin-wire zone there are a plurality of stationary drainage elements developed as flat suction boxes.

It has been attempted for decades with twin-wire formers of the known type to produce fiber webs (in particular, paper webs) of the highest possible quality with relatively high  
10 operating speeds. Due to the forming of the web between two wires, the result, in particular, is obtained that the final fiber web has substantially the same properties on both sides (little "two-sidedness"). However, it is difficult to obtain as  
15 uniform as possible a distribution of the fibers in the final fiber web. In other words, it is difficult to obtain a good "formation" since while the web is formed, there is always the danger that fibers will agglomerate and form flocculations. Therefore, it is attempted to form a jet of pulp slurry which  
20 pulp slurry is as free as possible of flocculations in the headbox (for instance, by means of a turbulence producer). It is, furthermore, endeavored so to influence the drainage of the fiber suspension during the web-forming that "reflocculation" is avoided as far as possible or that, after possible flocculation,  
25 a "deflocculation" (i.e. a breaking up of the flocculations) takes place.

It is known that a curved drainage element arranged in the first section of the twin-wire zone and, in particular, a stationary curved forming shoe developed in accordance with the  
30 aforementioned British Patent 1 125 906 counteracts the danger of reflocculation. This is true also of the drainage strips arranged in the British Patent in the second section of the twin-wire zone. Nevertheless, the danger of reflocculation is not completely eliminated in the arrangement according to said  
35 British Patent. Since the number of drainage strips there is very small, a large part of the web-forming takes place in the region

of the following flat-suction boxes. They, to be sure, are of high drainage capacity so that the web-forming can be completed in the region of the last flat suction boxes (i.e. the so-called main drainage zone, in which a part of the fiber material is still in the form of a suspension, terminates in the region of the flat suction box). The flat suction boxes, however, are not able to avoid reflocculation or to break up flocculations which have already occurred.

In order to control these last-mentioned difficulties, a web-forming device known under the name of "Duoformer D" has been developed (TAPPI Proceedings 1988 annual meeting, pages 75 to 80). This known web-forming device is part of a twin-wire former which has a single-wire pre-drainage zone. In the twin-wire zone there are provided, in the one wire loop, a plurality of strips which are fixed in position but adjustably supported, namely, on the bottom of a suction box which drains in upward direction. Furthermore, a plurality of resiliently supported strips are provided in the other wire loop. By this resilience of the last-mentioned strips, the following result can be obtained: For example, upon an increase of the amount of suspension entering between the two wire belts, the flexibly supported strips can move away somewhat. In this way, the danger (which is present when only firmly supported strips are used) is eliminated of a backing up taking place in the fiber suspension in front of the strips. Such a backing up could destroy the fiber layers which have been formed up to then on the two wire belts. In other words, with this known web-forming device, a drainage pressure, once established, remains constant due to the resiliently supported strips even upon a change in the amount of suspension fed or upon a change in the drainage behavior of the fiber suspension. Therefore, automatic adaptation of the web-forming device to said changed conditions occurs.

With this known web-forming device, fiber webs of relatively good formation can also be formed. With respect to this, however, the demands have increased considerably recently, so that further improvements are desirable.

SUMMARY OF THE INVENTION

The object of the invention is so to develop a twin-wire of the aforementioned kind that the quality of the fiber web produced is further improved, particularly with respect to its formation (cloudiness), and that the twin-wire former can easily be adapted to different operating conditions (for instance, with regard to quantity and drainage behavior of the fiber suspension).

This object is achieved by the features set forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.

The inventors have found that a combination of known features, namely:

- A. Twin-wire former without a single-wire pre-drainage zone or at least without a single-wire pre-drainage zone of any substantial length such as to cause any appreciable pre-drainage
- B. Start of the drainage in the twin-wire zone at a preferably curved drainage element, for instance on a rotating forming cylinder or, even better, on a curved stationary forming shoe
- C. Further drainage in the twin-wire zone between strips which are arranged along a "zig-zag" line, the strips which rest against the one wire belt being resiliently supported,

leads to an extremely high increase in the quality of the finished fiber web, so that it satisfies even the highest requirements. At the same time, the twin-wire former of the invention is insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Experiments have shown that it is possible by the invention to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contradistinction to this, in the known double-wire formers it is constantly found that there is a strong reduction in the retention upon an improvement in the formation.

It was, furthermore, found in experiments that in the second section of the twin-wire zone the number of strips can be considerably reduced as compared with the "Duoformer D". However, this number is substantially greater than in the case of the twin-wire former known from British Patent 1 125 906. It is advantageous to increase the distance between adjacent strips as compared with the "Duoformer D". In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.

To be sure, from German OS 31 38 133, FIG. 3, a twin-wire former is known the twin-wire zone of which is provided in a first section with a curved stationary drainage element and in a second section with strips arranged along a "zig-zag" line, which strips may also be resiliently supported and there being a relatively large distance between them. However, in that case, in front of the twin-wire zone there is a single-wire pre-drainage zone in which the forming of the web starts initially only in a lower layer of the fiber suspension fed while the upper layer remains liquid and tends very strongly to flocculation. It has been found that these flakes cannot be broken up again to the desired extent in the following twin-wire zone. Another disadvantage is that the twin-wire zone is diverted by a guide



roll (14b) behind the second section. This results (due to the so-called table-roll effect) in a further drainage which is uneven over the width of the web and thus in undesired variations in the quality of the web (recognizable, for instance, by disturbing longitudinal stripes).

#### BRIEF DESCRIPTION OF THE DRAWINGS

Other developments of the invention will be explained below with reference to embodiments which are shown in the drawing. Each of FIGS. 1 to 5 shows in simplified diagrammatic form one of the different embodiments.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The twin-wire former shown in FIG. 1 has a substantially horizontally extending twin-wire zone; this zone comprises three sections I, II and III arranged one behind the other. The endless wire belts (lower wire 11 and upper wire 12), shown only in part, travel in the direct vicinity of a headbox 10 over, in each case, a breast roll 13 and 14 respectively, so that the two wire belts together form a wedge-shaped entry slot 15 at the start of the twin-wire zone. The jet pulp discharged by the headbox 10 comes into contact with the two wire belts 11 and 12 only at the place where the lower wire 11 in the first section I of the twin-wire zone travels over a stationary curved forming shoe 16. The curved travel surface thereof is formed of several strips 16' with drainage slits present between them. The distance between the two breast rolls 13 and 14 is variable. The forming shoe 16 can be operated with or without vacuum. Additionally, although it is preferable that the forming shoe 16 be curved, a straight forming shoe may also be used in certain situations.

In the second section II of the twin-wire zone, the two wire belts 11 and 12 (with the partially still liquid fiber suspension present between them) travel between a lower drainage box 17 and an upper drainage box 18. In the lower drainage box 17 there are a row of at least two strips 27 (preferably of approximately rectangular cross section) which are pressed from

below resiliently against the lower wire 11. For this purpose, they are supported, for instance, on springs 24 (or pneumatic pressure cushions) on a, preferably water-permeable, plate. It is obvious that the force of the springs (or of the pressure prevailing in the pressure cushions) is individually adjustable.

The upper drainage box 18 is suspended on both the front and rear ends on vertically displaceable support elements as indicated diagrammatically by double arrows. On its lower side, there is a row of at least three strips 28 of preferably parallelogram cross section which rest against the upper side of the upper wire 12 and are rigidly attached to the box 18. Above the strips 28, a front vacuum chamber 21 and a rear vacuum chamber 22 are present in the drainage box 18.

Each of the upper strips 28 scrapes off water from the wire 12. Accordingly, the amount of water scraped off decreases in the direction of flow of the wire 12 from strip to strip. The drainage water from each of the strips 28 except the drainage water scraped off by the first strip may be drained away jointly. However, it is disadvantageous to also include the drainage water from the first strip 28 since this generally would disturb the operation of the other strips. Accordingly, a vertical channel 21a is positioned in front of the first upper strip 28 to carry away or collect the water scraped off by the first strip 28.

In the region of the forming shoe 16, a part of the water of the fiber suspension is led off downward; another part penetrates due to the tension of the upper wire 12-upwards through the upper wire and is deflected by the furthest in front of the strips 28 into the front vacuum chamber 21. The water passing upward between the upper strips 28 enters into the rear vacuum chamber 22. The water penetrating between the lower strips 27 through the lower wire 11, is led off downward. Between adjacent upper drainage strips 28 there is a minimum distance X of about three times the thickness Y of the strips. The same is true of the lower resiliently supported strips 27. It is important that each of the strips 27 and 28 lies in the region of a space between two opposite strips so that a "zig-zag"



arrangement (i.e. non-opposing relationship) is present. Also, as seen in FIG. 1, the first one of the strips 28 is located upstream of the first one of the strips 27. The two wires 11 and 12 preferably travel on a straight path through section II..

5 Gentle curvature of this section of the path is, however, also possible; see FIGS. 2 and 5. Differing from FIG. 1, the resiliently supported strips could also be arranged in the upper box 18 and the firmly supported strips in the lower box 17. In the third section III of the twin-wire zone, both wire belts 11 and 12 travel over another preferably curved forming shoe 23  
10 which (as shown) is arranged preferably in the lower wire loop 11. Behind it, an additional strip 29 with vacuum chamber 30 can be arranged in the loop of the upper wire 12. Furthermore, flat suction boxes 31 can be present in the loop of the lower wire.  
15 There (as is shown by dash-dot lines) the upper wire 12 can be separated by means of a guide roll 19 from the lower wire 11 and from the fiber web formed. Lower wire and fiber web then travel over a wire suction roll 20. The guide roll 19 can, however, also lie further back, so that the upper wire 12 is separated from the  
20 lower wire 11 only on the wire suction roll 20.

It is important that two drainage boxes 17 and 18 with the alternately resiliently and firmly supported ledge strips 27 and 28 lie not in the front or the rear sections but in the middle section II of the twin-wire zone, since only here can they  
25 develop their full effect, namely, intensive drainage of the fiber suspension fed while retaining the fine flocculation-free fiber distribution. This is achieved in the manner that the corresponding wire belt is imparted a slight (scarcely visible) deflection on each strip so that turbulence is constantly  
30 produced in the still liquid part of the fiber pulp. For success it is, however, also decisive that previously, in section I, a known pre-drainage towards both sides has already taken place and that this also takes place with the greatest possible retention of the flocculation-free condition of the fiber suspension.

35 For this two-sided pre-drainage, a stationary preferably curved forming shoe is provided in the first section I

of the twin-wire zone (in accordance with FIGS. 1 and 3-5) whenever it is a question of satisfying the highest quality demands with respect to the formation. This effect of the forming shoe is due to the fact that at least the one wire belt travels  
5 polygonally from strip to strip, each strip not only leading water away but also producing turbulence in the pulp which is still liquid. With such a forming shoe, it is, however, difficult at times to obtain a stable operating condition upon the starting of the paper machine. Therefore, it may be advantageous to  
10 provide a known forming roll 40 in accordance with FIG. 2 in Section I instead of the stationary forming shoe and the breast roll lying in front of it. This possibility will be utilized when, in particular, the highest productivity is demanded from the paper manufacturing machine.

15 In the third section III, the aforementioned strip 29 can serve either solely to lead away water upwards or, in addition, for the further production of turbulence (for further improvement in quality). The latter is possible if a part of the fiber pulp is still in liquid condition at this place.

20 In FIGS. 1 to 3, the distance between the two wires 11 and 12 in the twin-wire zone has been shown greatly exaggerated. By this, it is intended to make it clear that the two wires 11 and 12 converge towards each other over a relatively long path within the twin-wire zone. This makes it clear that the process  
25 of web-forming on the first forming shoe 16 (in Section I) commences relatively slowly and is completed only in Section III. In this connection, the end of the main drainage zone in which the two wires converge towards each other (and thus, the end of the web-forming process) can lie approximately in the center of  
30 the wrapping zone of the second forming shoe 23, as is indicated, merely by way of example, in FIGS. 1 to 3. The end of the wire convergence is symbolically indicated there by the point E; the solids content of the paper web has reached there approximately the value of 8%. This point can, however, also lie, for instance,  
35 on one of the flat suction boxes 31. Behind this point, it is attempted further to increase the solids content, if possible

even before the separation of the two wires. One goal is, namely, for the separation of the wires to take place with the highest possible solids content of the web so that as few fibers as possible are torn out of the web upon the separation. The nature and number of the drainage elements necessary for this within the twin-wire zone may, however, differ greatly and is dependent, among other things, on the type of paper and the raw-material components thereof, as well as on the operating speed.

The embodiments shown in FIGS. 2 and 3 differ from the others primarily by the fact that the twin-wire zone rises substantially vertically upward in the direction of travel of the wires. In this way, the removal of the water withdrawn from the fiber suspension is simplified since the water can be discharged relatively uniformly towards both sides. No vacuum chambers are required in particular in the central section II of the twin-wire zone. To be sure, the forming roll 40 of FIG. 2 is, as a rule, developed as a suction roll. The forming shoes 16, 23, particularly those arranged in the third section III, can, if necessary, be provided with a suction device.

Further elements of the twin-wire former shown in FIG. 2 are water-collection containers 41, 42 and 43, guide plates 44 associated with the fixed strips 28, and a water removal strip 45. The other elements are provided with the same reference numbers as the corresponding elements in FIG. 1. The same is true with regard to FIG. 3. One possible modification of FIG. 3 can consist therein that, instead of the wire suction roll 20, a forming roll is provided, and instead of the guide roll 19 the wire suction roll. A similar arrangement is known from German Utility Model 88 06 036 (Voith File: P 4539). Aside from this exception and aside from the embodiment according to FIG. 2 (with forming roll 40), the invention will, however, be used whenever possible-so to design the twin-wire former that the relatively expensive forming roll (as to purchase and operation) can be dispensed with. Thus, as a rule, the wire suction roll 20 is present as the sole suction roll. Furthermore, in all embodiments of the invention it can be seen to it that no guide roll which

deflects the twin-wire zone (and has the above-mentioned injurious table-roll effect) is present.

The embodiment of FIG. 4 differs from FIG. 1 among other things by the fact that, in the first section I of the twin-wire zone, a second curved stationary forming shoe 16a is arranged in the loop of the lower wire 11 behind and spaced from a first curved stationary forming shoe 16. Furthermore, in the loop of the upper wire 12 in the region between the two stationary forming shoes 16 and 16a there is provided an individual strip 50 which in known manner is part of a vacuum chamber 51. This vacuum chamber 51, similar to the upper drainage box 18 of FIG. 1, is suspended on its front and rear ends in vertically displaceable mounts. In this way, both the depth of penetration of the strip 50 into the path of travel of the upper wire 12 as well as the angle of attack of the strip 50 can be varied. With slight depth of penetration, the strip 50 serves solely for removal of water, while with greater depth of penetration it serves, in addition, for the production of turbulence in the suspension and, thus, for improvement of the formation. By the presence of two separate forming shoes 16 and 16a, the pre-drainage on both sides is temporarily interrupted; it is only continued after the strip 50 has removed from the upper wire 12 the water which has penetrated upward on the first forming shoe 16. In this way, higher operating speeds are possible.

Another difference from FIG. 1 is that, in the second section II of the twin-wire zone, the lower, flexibly supported strips 57 and the upper, firmly supported strips 58 are developed as individual strips. This means that each strip has its own supporting body 55/56. The lower strip-supporting bodies 55 are swingably mounted, the strip 57 being pressed resiliently by the force of springs 54 against the bottom of the lower wire 11. The supporting body 56 of each of the upper strips 58 is developed as vacuum chamber in the same way as that of the strip 50. The suspension of these vacuum chambers 56 corresponds to that of the vacuum chamber 51. It is important that each of the strips 57 and



58 rest with a given force of application (corresponding to the suspension pressure) against its wire belt 11 or 12. The strips 57 and 58 are adjusted in such a manner that a slight deflection of the wire belts takes place preferably on each strip. Due to the resilient supporting of the lower strips 57, the adjustment, once effected, is insensitive to changes in the quantity or quality of pulp, so that no backing up takes place in front of the strips and, nevertheless, an effective introduction of turbulence forces into the fiber suspension takes place. In contradistinction to FIGS. 1 to 3, there is the possibility of adjusting each one of the strips 57/58 individually with respect to position in height and inclination relative to the travel path of the wire. In this way, one can even better control the quality of the paper produced, with respect to both the formation and the nature of its surface (printability). Differing from FIG. 4, the upper strips 58 could be supported resiliently and the lower strips 57 stationary. Another alternative could consist therein that not only the upper strips 58 but also the lower strips 57 are fastened in vertically displaceable mounts (as shown on the vacuum chamber 51). In such case, the springs 54 might possibly be eliminated.

Another difference between FIGS. 1 and 4 resides in the fact that in FIG. 4 the twin-wire zone rises in the direction of travel of the wires upwards with an inclination of, on the average, about 20° with respect to the horizontal. In this way, it is possible to keep the entire height of the twin-wire former relatively slight. In the third section III of the twin-wire zone, a flat forming shoe 23' is provided rather than a curved one, differing from FIG. 1. The separation of the upper wire 12 from the lower wire and the fiber web formed can take place, as in FIG. 1, on one of the flat suction boxes 31. Instead of this, however, the upper wire 12 can also be conducted up to the wire suction roll 20. There, as shown, it can wrap around a small part (or, alternatively, a larger part) of the circumference of the wire suction roll and then be returned via the reversing roll 19. In the embodiment shown in FIG. 5, the twin-wire zone,

as a whole, extends substantially in horizontal direction. The individual elements are substantially the same as in the embodiment of FIG. 4. However, there is the difference that the drainage strips 57 and 58 lying in the second section II of the twin-wire zone are arranged along a downwardly curved path of the twin-wire zone. Accordingly, an upwardly curved forming shoe 16, 23 is provided in the first section I and in the third section III of the twin-wire zone. This embodiment is advisable, in particular, for the modernizing of existing Fourdrinier paper machines.

The embodiments shown have the feature in common that, in the second section II of the twin-wire zone, there are present preferably  $n$  flexibly supported strips 27/57 and  $n + 1$  rigidly supported strips. However, it is also possible to make the number of flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Instead of a rigidly supported strip, a feed or discharge edge of a drainage box can also be provided. The minimum number  $n$  of flexibly supported strips is two (see FIG. 4). However, three or four flexibly supported strips are preferred.



CLAIMS

What is claimed is:

1. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt, ~~that the strips contact~~ <sup>that the strips contact</sup>;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for  
 35 collecting the water drained from the fiber suspension by all of  
 the other drainage strips; and

the twin wire zone having a third section following the  
 second section along the path of the wire belts through the twin  
 wire zone; a second drainage element in the third section for  
 40 being engaged by one of the wire belts as the wire belts travel  
 over the second drainage element.

2. The twin wire former of claim 1, wherein the first  
 drainage element is stationary.

3. The twin wire former of claim 2, wherein the first  
 45 drainage element is curved and is engaged by one of the wire  
 belts for curving the path of the belts around the curved  
 drainage element after the entrance of the suspension into the  
 entrance slot.

4. The twin wire former of claim 3, wherein the first  
 drainage element has an open surface to enable drainage of water  
 from the fiber suspension.

~~5. The twin wire former of claim 1, wherein the twin  
 wire zone is free of rolls which deflect the twin wire zone.~~

~~6. The twin wire former of claim 1, wherein the twin  
 wire zone is free of any forming rolls.~~

~~7. The twin wire former of claim 1, wherein the first  
 drainage strips are located within the same wire belt loop as the  
 first drainage element and the second drainage strips are located  
 within the other wire belt group.~~

8. The twin wire former of claim 7, wherein the first  
 one of the second drainage strips is located upstream of the  
 first one of the first drainage strips and the last one of the

second drainage strips is located downstream of the last one of the first drainage strips.

9. The twin wire former of claim 1, further comprising means for supplying a vacuum in the area of the second drainage strips.

10. The twin wire former of claim 1, wherein each of the drainage strips has a respective thickness in the direction along the path through the twin wire zone; neighboring ones of the first drainage strips are spaced a minimum distance of about three times the respective first strip thickness, and neighboring ones of the second drainage strips are also spaced a minimum distance of about three times the respective second strip thickness.

11. The twin wire former of claim 1, wherein the support means for the second drainage strips include means enabling adjustment of the position of the second drainage strips relative to the second wire belt to set the initial rigid position thereof.

12. The twin wire former of claim 11, wherein the support means for the second drainage strips comprise a support body to which the second drainage strips are supported, and bearings on which the support body is supported for enabling displacement of the support body across the path of the wire belts through the second section.

13. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of at least one of the first and second drainage strips individually, and means supporting the respective support body for each strip to be displaceable for enabling displacement of the respective strip transverse to the direction of the path of the wire belts.

14. The twin wire former of claim 1, wherein the first and second support means comprise a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective support body of at least one of the first and second strips for enabling said at least one strip to be moved transverse to the direction of the path of the wire belts.

15. The twin wire former of claim 1, further comprising a curved stationary forming shoe in the first section of the twin wire zone and following after and spaced from the <sup>first</sup> curved drainage element along the path of the wire belts through the first section;

a first <sup>suction</sup> ~~section~~ strip disposed at the second wire belt and in the space between the <sup>first</sup> curved drainage element and the curved stationary forming shoe in the first section of the twin wire zone along the path of the wire belts through the twin wire zone for enabling removal of water from the second wire belt.

16. The twin wire former of claim 1, wherein the second drainage element in the third section of the twin wire zone is stationary.

17. The twin wire former of claim 16, wherein the second drainage element is curved.

18. The twin wire former of claim 17 wherein the second drainage element has a curvature that is curved in the same direction as the curvature of the curved drainage element in the first section of the twin wire zone.

19. The twin wire former of claim 18, further comprising an additional strip in the third section of the twin wire zone following the second drainage element and disposed against the other wire belt than the stationary drainage element.

20. The twin wire former of claim 18, wherein the first drainage element in the first section of the twin wire zone and the second drainage element in the third section of the twin wire zone are arranged against the same one of the first and second wire belts.

21. The twin wire former of claim 1, further comprising a suction roll at one of the wire belts and located after the <sup>second</sup> first drainage element along the path of the wire belts; both of the wire belts being wrapped about part of the circumference of the suction roll.

22. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises substantially vertically upwardly in the path of travel of the wire belts through the twin wire zone.

23. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone rises gradually upwardly along the path of travel of the wire belts through the twin wire zone at an incline with respect to the horizontal in the range of about 10° to 30°.

24. The twin wire former of claim 1, wherein the first and the second drainage strips in the second section of the twin wire zone are both arranged one after the other along the path of the wire belts through the twin wire zone so as to define a curvature for the path of the wire belts through the second section.

25. The twin wire former of claim <sup>24</sup> 1, wherein the first and second drainage strips are positioned in the second section of the twin wire zone to define a curvature for the path of the wire belts through the second section of the twin wire zone that is opposite the curvature of the curved drainage element in the first section of the twin wire zone.

26. The twin wire former of claim 1, wherein the means for directing the wire belts are positioned so that the twin wire zone extends substantially horizontally;

the first drainage element in the first section of the twin wire zone being generally curved upwardly for giving the path of the wire belts through the first section of the twin wire zone a generally upward curve; the first and second drainage strips in the second section of the twin wire zone being so positioned as to give the wire belts a generally downward curvature through at least part of the second section of the twin wire zone and the stationary drainage element in the third section of the twin wire zone is curved in a direction to give the wire belts passing through the third section of the twin wire zone a generally upward curvature.

27. The twin wire former of claim 1, wherein the stationary drainage element is curved.

28. The twin wire former of claim 1, wherein the stationary drainage element includes means for providing suction thereto to facilitate drainage of water.

29. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and



15 directed for delivering fiber suspension from the headbox to the  
wedge shaped entrance slot of the first section of the twin wire  
zone;

the twin wire zone having a second section following  
the first section along the path of the belts through the twin  
20 wire zone; in the second section, a plurality of first drainage  
strips are positioned within the loop of the first wire belt and  
are for contacting the first wire belt; in the second section, a  
plurality of second drainage strips are positioned within the  
loop of the second wire belt and are for contacting the second  
25 wire belt; the first strips being shifted in position along the  
path of the wire belts with respect to the second strips so that  
the first and second strips are offset and in a non-opposing  
relationship; first support means for resiliently supporting the  
first drainage strips against the respective wire belt that <sup>the</sup> strips  
30 contacts, the last one of the second drainage strips being  
located downstream of the last one of the first drainage strips;

second support means supporting the second drainage  
strips rigidly against the second wire belt;

the twin wire zone having a third section following the  
35 second section along the path of the wire belts through the twin  
wire zone; a <sup>second</sup> drainage element in the third section for being  
engaged by one of the wire belts as the wire belts travel over  
the <sup>second</sup> drainage element, the <sup>second</sup> drainage element having an open surface  
to enable water to be drained through the wire belt in contact  
40 therewith; and

the twin wire zone being free of rolls which deflect  
the twin wire zone.

30. A twin-wire former for the production of a paper  
web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for  
directing the wire belts to travel along a path together for  
5 forming a twin wire zone of the twin wire former, with the web  
between the wire belts as the wire belts travel along the path

through the twin wire zone, neither wire belt defining a single wire predrainage zone of a substantial length;

each wire belt forming an endless loop;

10 the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and  
15 directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin  
20 wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second  
25 wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strip  
30 contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the  
35 second section along the path of the wire belts through the twin wire zone; a <sup>second</sup> drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the <sup>second</sup> stationary drainage element; and  
a the twin wire zone being free of any forming rolls.

08/556769

5718805

O.G. FIG. 2  
CLASS SUBCLASS  
162 301  
DRAFTSMAN

Fig.1

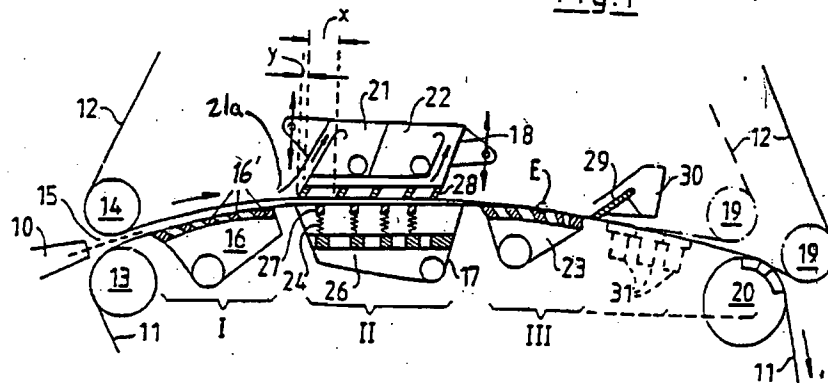


Fig.2

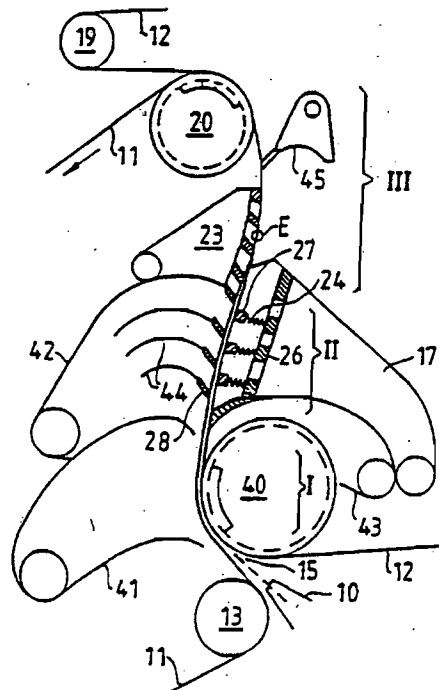
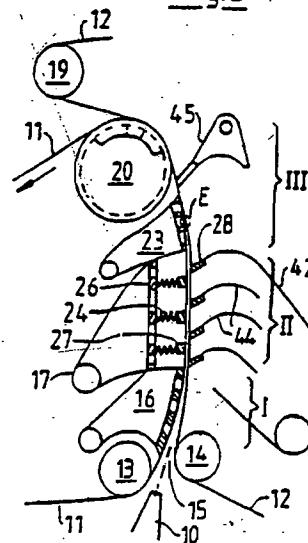


Fig.3



O.G. FIG.  
CLASS SURCLASS  
CRAFTSMAN

00/556769

Fig.4

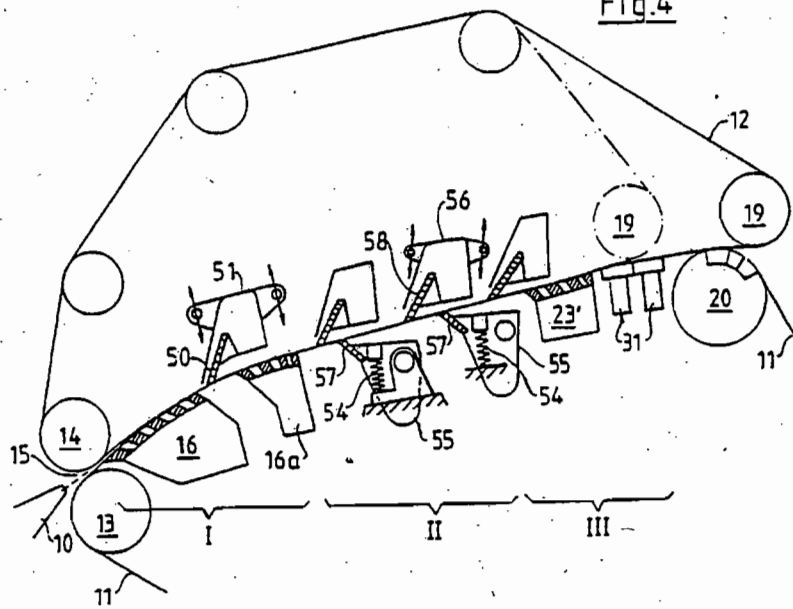
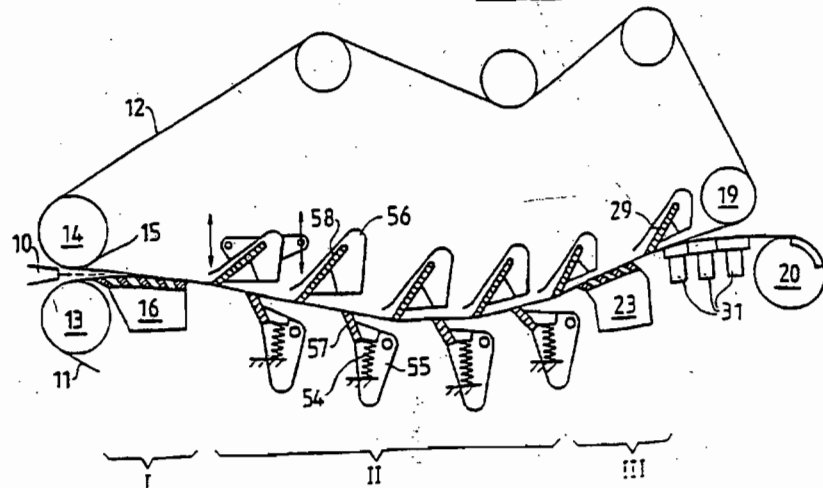


Fig.5



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AS ORIGINALLY FILED

08/556769

Fig.1

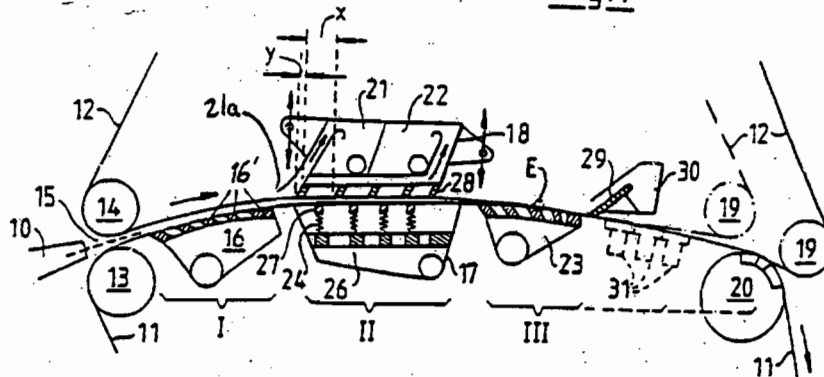


Fig.2

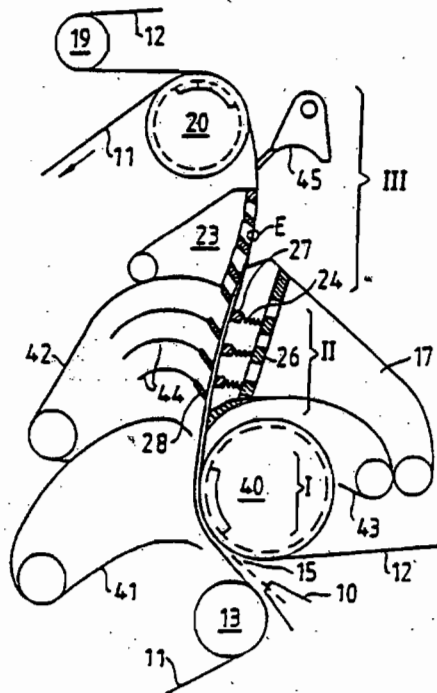
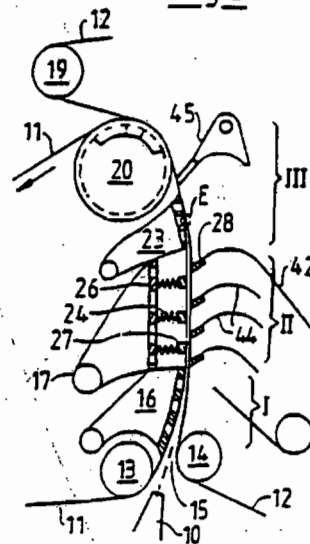


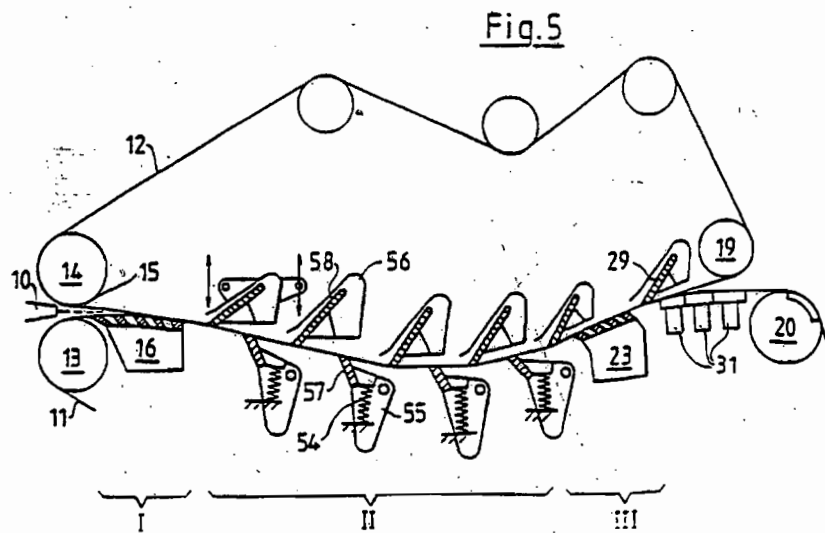
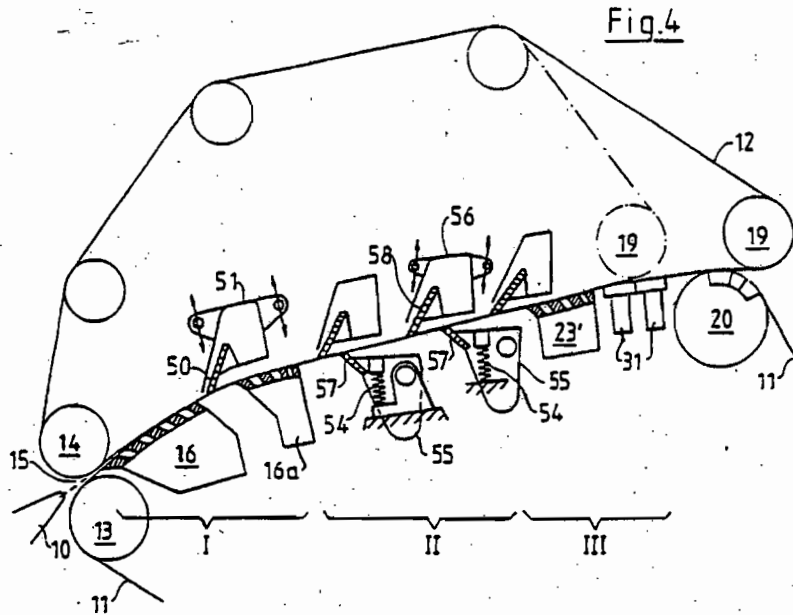
Fig.3



below  
8/1989

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AS ORIGINALLY FILED

08/556769





P/14-363

INVENTORS DESIGNATION SHEET

TITLE: TWIN WIRE FORMER

PRIORITY CLAIMED UNDER 35 U.S.C. §119: Convention Date August 22, 1989 for German Appln. S.N. P 39 27 597.3

INVENTOR #1: Rudolf BUCK  
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CITIZENSHIP: Germany

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INVENTOR #3: Klaus HENSELER  
RESIDENCE: D-7920 Heidenheim  
P.O. ADDRESS: Wildstr. 20  
D-7920 Heidenheim, Germany  
CITIZENSHIP: Germany

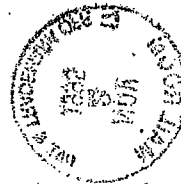
INVENTOR #4: Werner KADE  
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P.O. ADDRESS: 521 Harbor Light Court  
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CITIZENSHIP: Germany

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CITIZENSHIP: Germany



SEND CORRESPONDENCE TO:

OSTROLENK, FABER, GERB & SOFFEN  
1180 Avenue of the Americas  
New York, New York 10036-8403

Telephone No.: 212-382-0700

Attention: Martin Pfeffer  
Registration No. 20,808

# **EXHIBIT G**


**UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office**

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

| SERIAL NUMBER | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
|---------------|-------------|----------------------|---------------------|
|---------------|-------------|----------------------|---------------------|

|            |          |         |  |
|------------|----------|---------|--|
| 08/556,769 | 11/02/95 | EGELHOF |  |
|------------|----------|---------|--|

D P/14-363

**EXAMINER**

HASTINGS, K

**ART UNIT**
**PAPER NUMBER**

13M1/1004

 OSTROLENK FABER GERB & SOFFEN  
1180 AVENUE OF THE AMERICAS  
NEW YORK NY 10036-8403

1303

**DATE MAILED:**

10/04/96

 This is a communication from the examiner in charge of your application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☒ Responsive to communication filed on 9-19-96 ☐ This action is made final.

 A shortened statutory period for response to this action is set to expire 3 month(s), — days from the date of this letter.  
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

**Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:**

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input checked="" type="checkbox"/> Notice of Draftsman's Patent Drawing Review, PTO-948. |
| 3. <input checked="" type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449.      | 4. <input type="checkbox"/> Notice of Informal Patent Application, PTO-152.                  |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474.     | 6. <input type="checkbox"/>  |

**Part II SUMMARY OF ACTION**
☒ Claims 1-31 are pending in the application.

 Of the above, claims — are withdrawn from consideration.

 2. ☐ Claims — have been cancelled.

 3. ☐ Claims — are allowed.

 4. ☒ Claims 1-31 are rejected.

 5. ☐ Claims — are objected to.

 6. ☐ Claims — are subject to restriction or election requirement.

 7. ☐ This application has been filed with Informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.

 8. ☐ Formal drawings are required in response to this Office action.

 9. ☐ The corrected or substitute drawings have been received on —. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☐ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).

 10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on —, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).

 11. ☐ The proposed drawing correction, filed —, has been ☐ approved; ☐ disapproved (see explanation).

 12. ☒ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☐ not been received  
has been filed in parent application, serial no. 055719; filed on 4/29/93

 13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.

 14. ☐ Other

**EXAMINER'S ACTION**

Serial Number: 08/556,769

-2-

Art Unit: 1303

Claims 1-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, 29, 30 line 8 "of a substantial length" is relative and thus indefinite; how long/short may be length be to be substantial/not substantial? This phrase must be deleted. Furthermore the original specification teaches "without a single wire predrainage zone" The addition of "at least without... of any substantial length is deemed to be new matter not supported by the original specification, thus WO 91/02842 is available as prior art against these claims.

Claim 1 it is unclear which strips first and second means for collecting water is meant for, all of the first and second drainage strips are implied in the current language, yet that is not clear nor supported by the specification. It appears that --second-- should be inserted before "drainage" on line 33 and line 36 of claim 1 to be clear and consistent with the specification.

Claim 10 line 2 delete the quotation marks as unnecessary.

The non-statutory double patenting rejection, whether of the obviousness-type or non-obviousness-type, is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or

Serial Number: 08/556,769

-3-

Art Unit: 1303

improper timewise extension of the "right to exclude" granted by a patent. *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); and *In re Goodman*, 29 USPQ2d 2010 (Fed. Cir. 1993).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(b) and (c) may be used to overcome an actual or provisional rejection based on a non-statutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.78(d).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-31 are rejected under the "judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-18 and claims 1, 2 of U.S. Patent No. 5,389,206 and 5,500,091, respectively. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are merely of slightly differing scope from those of the two patents; for example it would have been prima facie obvious to eliminate the stationary feature of claim 1, of '206 patent or to use first and second means for collecting water as claimed in claim 1 of this case as such is conventional and well known to the artisan and in any event this feature was disclosed in both '206 and '091 specification and could have been claimed in those cases.

Claims 1-31 are rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103 as



Serial Number: 08/556,769

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Art Unit: 1303

obvious over WO 91/02842 or under 35 USC 103 as obvious over WO 842 in view of Halme et al.

Each independent claim contains a limitation not disclosed in the parent specification re: "neither wise belt defining a single wire predrainage zone of a substantial length" (emphasis provided) Applicants are therefore only entitled to the instant filing date of Nov 25, 1995 for these claims and WO '842 is available as prior art. See In re Van Langehoven 173 USPQ 426.

WO 842 teaches everything in these claims except there is no single wire predrainage zone which is encompassed by the language. However the language also encompasses that there can be a predrainage zone and if necessary Halme et al is cited as teaching the alternative of a gap former with no single wire predrainage zone or having such a zone. Thus it would have been prima facie obvious to have such a zone in WO '842 as a known alternative configuration in this art.

Claims 1-4, 7-28 and 31 are rejected under 35 U.S.C. § 103 as being unpatentable over Tissari or Koski in view of DE '133, further in view of Nyman or WO 86/04368 or Nevalainen et al.

Tissari, especially Fig 6, shows almost every feature of claim 1 except it does not specify that strips 44 are resiliently supported or first/second means for collecting water,

Serial Number: 08/556,769

-5-

Art Unit: 1303

Likewise Koski shows almost every feature of claim 1 except resilient support of strips 17 or 37 (note one can view Koski either roll 21 or roll 15 as curved drainage element and then strips 17 or 37 respectively as strips in same belt loop as curved drainage element) and first and second means for collecting water.

However the artisan is well aware of the option and advantages of resiliently supported strips, means for collecting water, and vacuum means (claim 9) as evidenced by DE '133. Thus it would have been prima facie obvious to resiliently support at least one or more of the appropriate strips in either reference for the known advantages of same. Furthermore to use vacuum means (claim 9) for the well known advantage of increased dewatering is also prima facie obvious to the artisan and is simply suggested by both DE '133 and Tissari or Koski when viewed as a whole; see for example Tissari col 7 line 59 to col 8 line 2. Note DE '133 Fig 3 can have suction in both the upper and/or lower box to aid dewatering.

In addition, when using vacuum for the second upper drainage strips especially, it is well known and conventional to use a separate collecting means for the first strip versus all the other strips - see for example Nyman's first slot for first strip

Serial Number: 08/556,769

-6-

Art Unit: 1303

versus subsequent collecting means, WO 86/04368 also depicts this feature as well as Nevalainen et al. Also to have individual water collectors for each strip is suggested by Tissari Fig 5 element 40.

Furthermore, even without a reference, providing means to collect water stripped off by dewatering elements is conventional in this art, and absent evidence of unexpected results or criticality, to optimize how many and where the means for collecting water are located would have been prima facie obvious.

Claims 5 and 6 would be allowable if rewritten to overcome the rejection under 35 U.S.C. 112 and to include all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Exr. Hastings whose telephone number is (703) 308-0470. The examiner can normally be reached on Monday-Thursday from 6:30 AM to 5:00 PM.

*obv type  
double  
patenting  
rejection*

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Don Czaja, can be reached on (703) 308-3852. The fax phone number for this Group is (703) 305-7115.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0651.

Exr Hastings/krb  
October 3, 1996

*ECM Hastings*  
HASTINGS  
EXAMINER  
ART UNIT 133  
*10-4-96*

# **EXHIBIT H**



246 D2 CP 1303  
#B/BM  
8/4-91  
P/14-363

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of New York, New York  
Rudolf BUCK et al. Date: March 4, 1997  
Serial No.: 08/556,769 Group Art Unit: 1303  
Filed: November 2, 1995 Examiner: K. Hastings  
For: TWIN WIRE FORMER

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

AMENDMENT

Sir:

Responsive to the Office Action dated October 4, 1996,  
please amend the above-identified application as follows:

IN THE CLAIMS:

Please cancel claims 1/4, 7-28 and 31 without  
prejudice.

Please amend the claims as follows:

1. (Amended) A twin-wire former for the production of  
a paper web from a fiber suspension, the twin wire former  
comprising:

first and second web forming wire belts, means for  
directing the wire belts to travel along a path together for  
forming a twin wire zone of the twin wire former, with the web  
between the wire belts as the wire belts travel along the path  
through the twin wire zone, neither wire belt defining a single  
wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which  
includes a first drainage element at the start of the path

through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section; a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, [The twin wire former of claim 1, wherein] the twin wire zone being [is] free of rolls which deflect the twin wire zone.

26. (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:



first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt;

first means for collecting the water drained from the fiber suspension by the most upstream one of the drainage strips;

second means separate from the first means for collecting the water drained from the fiber suspension by all of the other drainage strips; and

the twin wire zone having a third section following the second section along the path of the wire belts through the twin

B<sup>1</sup>

wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element. [The twin wire former of claim 1, wherein] the twin wire zone being [is] free of any forming rolls.

3/ 29. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];

each wire belt forming an endless loop;

B<sup>2</sup>

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the

strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of rolls which deflect the twin wire zone.

B<sup>2</sup>

4.70. (Twice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and

are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact, the last one of the second drainage strips being located downstream of the last one of the first drainage strips;

second support means supporting the second drainage strips rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section for being engaged by one of the wire belts as the wire belts travel over the second drainage element; and

the twin wire zone being free of any forming rolls.

Please add the following new claims 32 and 33:

32. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a <sup>single</sup> first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire

zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and

means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith; and

the twin wire zone being free of ~~guide~~ rolls which deflect the twin wire zone and which cause a table roll effect.

33. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:



first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

each wire belt forming an endless loop;

the twin wire zone having a first section which includes a first drainage element at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, a plurality of second drainage strips are positioned within the loop of the second wire belt and are for contacting the second wire belt; the first strips being shifted in position along the path of the wire belts with respect to the second strips so that the first and second strips are offset and in a non-opposing relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that the strips contact;

second support means supporting the second drainage strips rigidly against the second wire belt; and



means for supplying a vacuum in the area of the second drainage strips;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a second drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the second drainage element, the second drainage element having an open surface to enable water to be drained through the wire belt in contact therewith;

the twin wire zone being free of solid rolls which deflect the twin wire zone and which cause a table roll effect.--

#### REMARKS

Applicants gratefully appreciate the allowability of claims 5, 6, 29 and 30.

Claims 5, 6, 29 and 30 have been amended to address the Examiner's rejection thereof under 35 U.S.C. §112 and, in the case of claims 5 and 6, to place these claims in independent form. With respect to the rejection under 35 U.S.C. §112 concerning lines 33 and 36 of claim 1, applicants respectfully submit that the present language is clear. Since it does not matter whether the most upstream one of the drainage strips is a first drainage strip or a second drainage strip, the interpretation given to the language by the Examiner is correct and is the intended meaning.

Claims 1-4, 7-28 and 31 have been cancelled and claims 32 and 33 have been added to more adequately protect applicants' invention.

With respect to the double patenting rejection, although applicants do not agree that this is well taken, in order to expedite prosecution of this application, applicants are enclosing herewith Terminal Disclaimers, one relating to U.S. Patent No. 5,389,206 and the other relating to U.S. Patent No. 5,500,091. Accordingly, it is respectfully requested that the rejection of claims 1-31 under the judicially created doctrine of obviousness type double patenting be withdrawn.

Claims 1-31 stand rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103 as being obvious over WO91/02842 or 35 U.S.C. §103 as obvious over WO '842 in view of Halme et al. (U.S. Patent No. 3,994,774). Claims 5, 6, 29 and 30 have been amended to delete the phrase "of a substantial length". Accordingly, WO '842 is not available as prior art against claims 5, 6, 29 and 30. Applicants, therefore, request withdrawal of the rejection of claims 5, 6, 29 and 30 on this ground.

Claims 1-4, 7-28 and 31 were rejected under 35 U.S.C. §103 as being unpatentable over Tissari or Koski in view of DE '133, further in view of Nyman or WO 86/04368 or Nevalainen et al. All of these claims have been cancelled. Accordingly, this rejection is now moot.

With respect to new claims 32 and 33, it is respectfully submitted that these claims are patentable for the same reasons as claims 5, 6, 29 and 30. More specifically, claim 32 specifies that the twin wire zone is free of guide rolls which deflect the twin wire zone and which causes a table roll affect. Support for this limitation may be found on page 5, lines 32 to page 6.

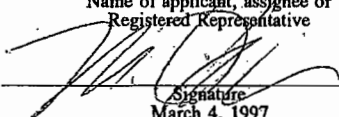
With respect to claim 33 this is the same as claim 32 except "guide rolls" have been changed to "solid rolls". It is believed that this language is supported by the disclosure of a guide roll which, as is well known, has a smooth surface as compared to other rolls, such as forming rolls or suction rolls whose surfaces are generally perforated. Accordingly, it is respectfully submitted that the disclosure of the single species of a guide roll is sufficient support for applicants claim of a solid roll in claim 33. In this connection see MPEP §2164.03 which states:

A single embodiment may provide broad enablement in cases involving predictable factors, such as mechanical or electrical elements. In re Vickers, 141 F.2d 522, 61 USPQ 122 (CCPA 1944); In re Cook, 439 F.2d 730, 169 USPQ 298 (CCPA 1971).

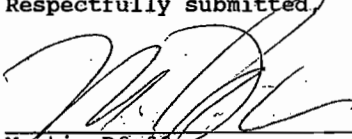
Vickers was also cited as support for a predecessor of Section 2164.03 which stated that: "In mechanical cases, broad claims may properly be supported by a single form of an apparatus or structure". See In re Cook, supra at p. 301. Both Vickers and Cook further hold that the basis for this proposition is that in mechanical cases it is obvious from the disclosure of one species that other species will work, whereas the same is not true in non-predictable arts, such as chemical cases.

In view of the foregoing, it is respectfully submitted that this application is now in condition for allowance. Accordingly, reconsideration and allowance of the application are respectfully requested.

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Martin Pfeffer  
Name of applicant, assignee or  
Registered Representative  
  
Signature  
March 4, 1997  
Date of Signature

Respectfully submitted,

  
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Enclosures

# **EXHIBIT I**



# F/BM  
15/12-1-93

FA-1875 CONT (14-285)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of  
Rudolf Buck et al.  
Serial No.: 08/055,918  
Filed: April 29, 1993  
For: TWIN WIRE FORMER

New York, New York  
Date: November 10, 1993  
Group Art Unit: 1303  
Examiner: Karen Hastings

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

AMENDMENT

Sir:

In response to the Office Action mailed July 15, 1993, please reconsider the above-identified application amended as follows:

IN THE SPECIFICATION:

OK Page 5, line 18, delete "(claim 2)".

Page 8, line 1, after "present" insert as a new sentence: --Also, as seen in Fig. 1, the first one of the strips 28 is located upstream of the first one of the strips 27.--

IN THE CLAIMS:

13. (Thrice Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone [of a substantial length];  
each wire belt forming an endless loop;

AMDT58980

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the twin wire zone having a first section at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone; a curved drainage element in the first section, the curved drainage element having an open surface to enable drainage of water from the fiber suspension and being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

<sup>25</sup>  
F2 the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, [at least two] a plurality of first drainage strips are positioned within the loop of the first wire belt and are for contacting the first wire belt; in the second section, [at least one] a plurality of second drainage [strip] strips [which is] are positioned within the loop of the second wire belt and [is] are for contacting the second wire belt; [one of] the first [and second] strips being shifted in position along the path of the wire belts with respect to the [other of the first and] second strips so that the first and second strips are not in an opposing [in a staggered] relationship; first support means for resiliently supporting the first drainage strips against the respective wire belt that strip contacts;

second support means supporting the [at least one] second drainage [strip] strips rigidly against the second wire belt;

the first drainage strips being located within the same wire belt loop as the curved drainage element and the second drainage strips being located within the other wire belt loop;



the first one of the second drainage strips being located upstream of the first one of the first drainage strips;

means for supplying a vacuum in the area of the second drainage strips;

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the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element, the stationary

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drainage element having an open surface to enable water to be drained through the wire belt in contact therewith.

Claim 18, line 1, change "17" to --13--.

Claim 21, line 6, after "said" insert --at least--.

Please cancel claim 14 and add the following new claims:

34. The twin wire former of claim 13, wherein the twin wire zone is free of rolls which deflect the twin wire zone.

117/35. The twin wire former of claim 13, wherein the stationary drainage element is curved.

118/36. The twin wire former of claim 13, wherein the stationary drainage element includes means for providing suction thereto to facilitate drainage of water.

Claim 16, line 1, change "14" to --34--.

#### REMARKS

The specification has been amended to delete an inappropriate reference. The specification has also been amended to describe that the first one of the drainage strips is located upstream of the first one of the first drainage strips, as

suggested by the Examiner. Claim 13 has been amended to better define applicants' invention. Additionally, claim 13 has been amended to incorporate the substance of claim 14 therein as suggested by the Examiner, and claim 14 cancelled. Claims 18 and 21 have been amended to address the Examiner's comments with respect to those claims. New claims 34-36 have been added to more adequately protect applicants' invention. The dependency of claim 16 has been changed from claim 14 to new claim 34 for reasons which will be further discussed below. Reconsideration of the application as amended is respectfully requested.

The specification has been objected to as failing to provide proper antecedent basis for the claimed subject matter in view of the amendment to the specification, it is believed that this objection has been fully overcome and, accordingly, it is respectfully requested that it be withdrawn.

Claims 13, 14, 16, 18-21, 23-33 stand rejected under 35 USC § 112, second paragraph, as being indefinite. It is believed that the amendments to claims 13, 18 and 21 address all of the Examiner's § 112, second paragraph, rejections, and, accordingly, that the claims now fully comply with 35 USC § 112. Accordingly, it is respectfully requested that the rejection of the claims on this ground be withdrawn.

Claims 13, 14, 16, 18-21 and 23-33 stand rejected under 35 USC § 103 as being unpatentable over Koski (U.S. Patent No. 4,925,531) or Tissari (U.S. Patent No. 4,609,435) each in view of German Patent Document DE 3,138,133 (DE '133). Applicants respectfully traverse such rejections as applied to the amended claims.

Claim 13, as amended, now specifies that the drainage element in the first section has an open surface to enable drainage of water therethrough. Neither Tissari nor Koski disclose such a curved drainage element.

Thus, Tissari in Figure 6 discloses a forming deck 43 having a closed surface. See column 6, line 49. Koski, on the other hand, teaches several deflectors 24 at a location similar to the one where the curved drainage element in the first section of claim 13 appears. Such deflectors are not drainage elements. Assuming arguendo that they may be considered to constitute a drainage element, they do not present a curved surface and, therefore, do not constitute a curved drainage element.

It should also be noted that claim 13 further distinguishes over Tissari by specifying that the stationary drainage element in the third section has an open surface to enable water to be drained therethrough. In contrast, Tissari teaches a rib deck 48 (see column 6, lines 55 and 56) which is not disclosed as having an open surface, as set forth in claim 13, or as being curved, as set forth in claim 35, or as having means for providing suction, as set forth in claim 36.

In addition to the changes discussed above further defining the curved drainage element in the first section as differentiating over Koski and Tissari, and the definition of this stationary drainage element in the third section as differentiating over Tissari, applicants reiterate the arguments set forth in the amendment dated March 30, 1993 that it is not obvious to modify Tissari and Koski so that the drainage elements in one bank are resiliently supported while those in the other bank are originally the support.

In view of the foregoing, applicants respectfully submits that claim 13 now clearly distinguishes over the references and is in allowable condition, which action is respectfully requested. Claims 16, 18-21 and 23-36 are all dependent, either directly or indirectly, from claim 13 and therefore believed allowable for the same reasons.

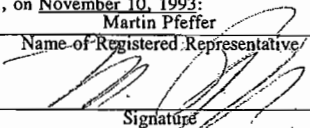
In addition, claim 34 now sets forth that the twin wire zone is free of rolls which deflect the twin wire zone. Such arrangement is neither taught nor suggested by DE '133. Accordingly, even assuming that the Examiner's combination of Tissari, Koski and DE '33 is suggested by the art (and applicants do not agree that it is), there is still no teaching or suggestion that the twin wire zone should be free of rolls which deflect the twin wire zone. It is respectfully submitted, therefore, that, regardless of the patentability of claim 13, claim 34 is independently patentable over the references because of such limitation.

Claim 16 has been made dependent from claim 34 so that claim 16 now recites all of the limitation which the Examiner indicated would constitute an allowable claim.

In view of the foregoing, this application is now believed to be in condition for allowance, which action is respectfully requested.

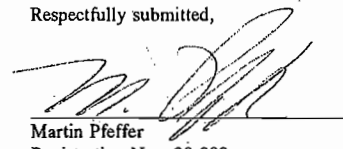
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Martin Pfeffer  
Name of Registered Representative

  
Signature  
November 10, 1993  
Date of Signature

MP:ss

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# **EXHIBIT J**

**United States Patent** [19]**Koski**[11] **Patent Number:** **4,925,531**[45] **Date of Patent:** **May 15, 1990**[54] **TWIN WIRE FORMER FOR A PAPER MACHINE**[75] **Inventor:** Erkki Koski, Jyväskylä, Finland[73] **Assignee:** Valmet Paper Machinery Inc.,  
Finland[21] **Appl. No.:** 355,180[22] **Filed:** May 22, 1989[30] **Foreign Application Priority Data**

May 23, 1988 [FI] Finland ..... 882422

[51] **Int. Cl.<sup>5</sup>** ..... D21F 1/00[52] **U.S. Cl.** ..... 162/301; 162/303;  
162/352[58] **Field of Search** ..... 162/300, 301, 303, 348,  
162/352[56] **References Cited****U.S. PATENT DOCUMENTS**

|           |         |                |         |
|-----------|---------|----------------|---------|
| 4,209,360 | 6/1980  | Stenberg       | 162/301 |
| 4,417,950 | 11/1983 | Bubik et al.   | 162/300 |
| 4,532,008 | 7/1985  | Creagan et al. | 162/301 |

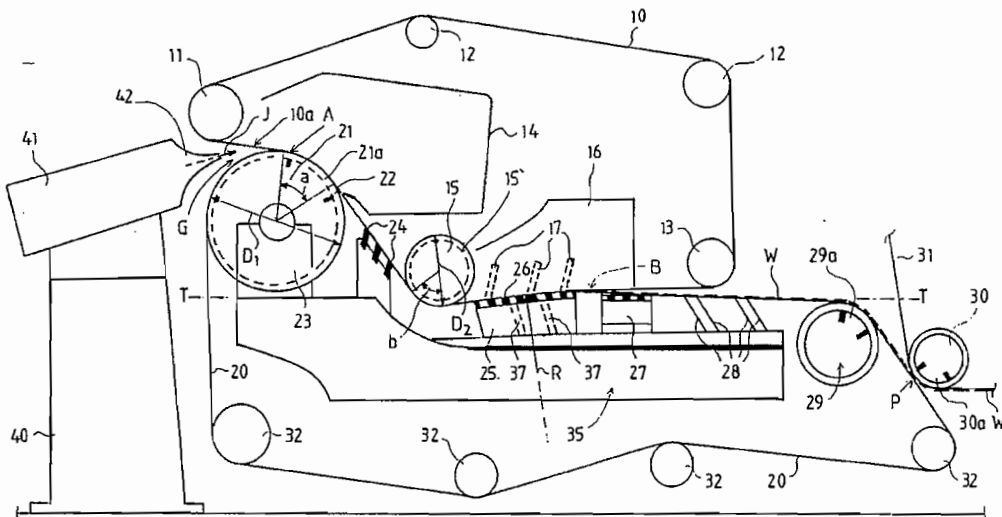
**FOREIGN PATENT DOCUMENTS**

|         |         |                      |         |
|---------|---------|----------------------|---------|
| 3222428 | 12/1983 | Fed. Rep. of Germany | 162/301 |
|---------|---------|----------------------|---------|

1119796 6/1986 Japan ..... 162/348

*Primary Examiner*—Karen M. Hastings*Attorney, Agent, or Firm*—Steinberg Raskin[57] **ABSTRACT**

A twin-wire former for a paper machine having a lower wire and an upper wire. The former has a twin-wire forming zone which has forming members and forming zones situated in a specific sequence as follows. A downwardly curved forming zone is confined to a sector of a large-diameter forming roll mounted on a frame of a lower wire unit, the magnitude of this sector being within the range of  $<90^\circ$ . A second forming roll then follows which is preferably provided with a hollow face and onto which the wires arrive from the first forming roll. The twin-wire forming zone is curved within a certain sector of less than  $90^\circ$  on the second forming roll so as to become horizontal. A forming shoe is provided with a ribbed deck and fitted after the second forming roll inside the lower wire loop, this forming shoe having a relatively large curve radius after which the twin-wire forming zone ends and the web is arranged to follow along with the lower wire.

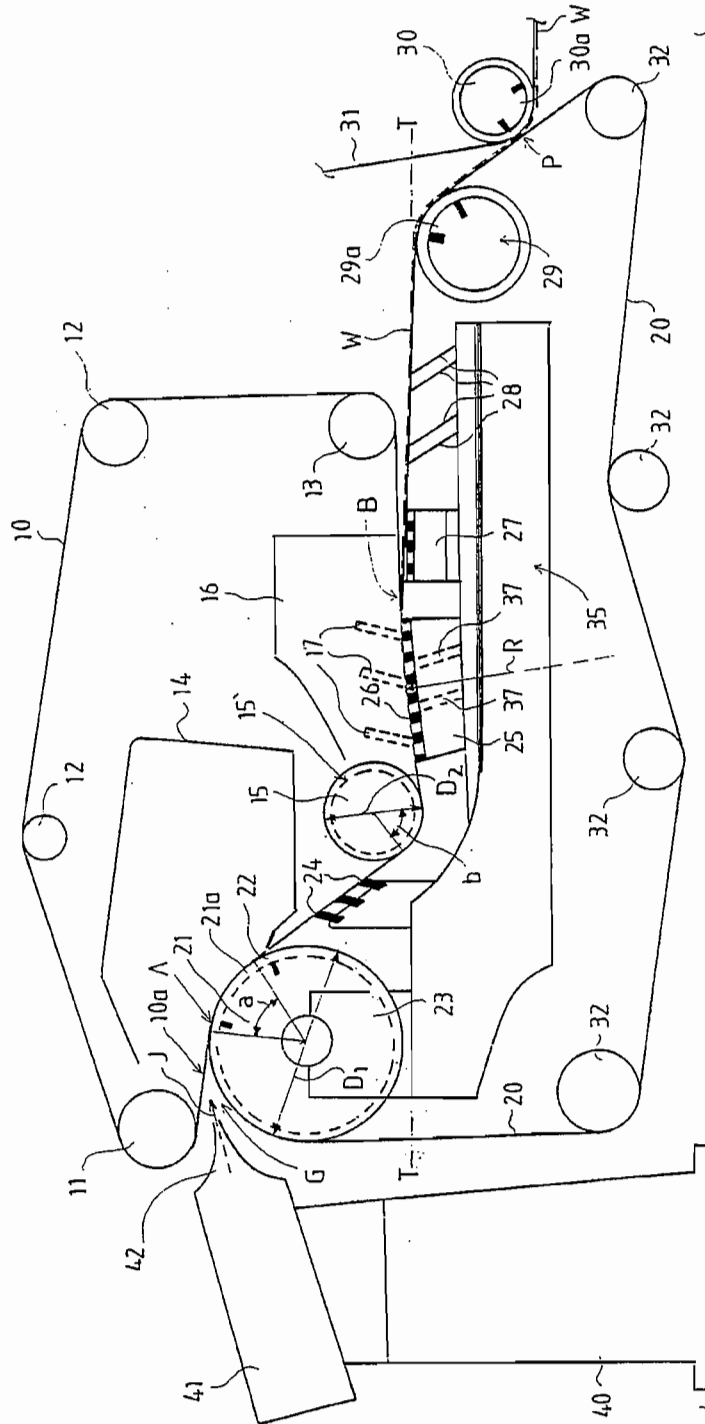
**16 Claims, 1 Drawing Sheet**



U.S. Patent

May 15, 1990

4,925,531



## TWIN WIRE FORMER FOR A PAPER MACHINE

## BACKGROUND OF THE INVENTION

The present invention concerns a twin-wire former for a paper machine, in particular for rebuilding of existing fourdrinier wire parts. The twin-wire former comprises a lower wire and an upper wire, these wires being guided by guide rolls, by forming rolls, and by a web-forming member. The former comprises a first forming roll at which the lower wire which runs over the first forming roll together with the upper wire, defining a forming gap in connection with the first forming roll, into which a slice part of a headbox feeds a pulp suspension jet.

With respect to the prior art related to the present invention, reference is made to a twin-wire former marked by Valmet under the trademark SPEED-FORMER HHS, which is a gap former principally intended for rebuilding of existing fourdrinier wire parts. A first object of the present invention is to provide a new former concept principally for the same purposes as this SPEED-FORMER HHS.

A starting point of the present invention is a so-called gap former in which, in a gap area, a forming roll or cylinder or relatively large diameter is used.

With respect to further prior art most closely related to the present invention, reference is made to FI Patent Application No. 851035 (Beloit Corporation), corresponding to U.S. Pat. No. 4,209,360 as well as to U.S. Pat. No. 4,209,360 corresponding to SE Pat. No. 7800775-4 (AB Karlstads Mek. Verkstad). The objectives of the present invention are partially the same as those of U.S. Pat. No. 4,209,360.

## SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a new type of former which is well-suited for rebuilding of existing fourdrinier wire parts, i.e. for conversion of such formers to twin-wire formers so that the frame structures, the rolls, and the draining equipment of the old wire unit can be retained to as great an extent as possible.

It is a further object of the present invention to provide a twin-wire former by means of which good retention and formation are obtained and in which unequal-sidedness of the web to be formed is avoided, i.e. the paper web to be produced can be made as symmetric as possible, and such that the web has adequate internal bond strength.

These and other objects are attained by the present invention which is directed to a twin-wire former for a paper machine having a twin-wire forming zone comprising, in the following sequence of twin-wire run,

(i) a downwardly-curved forming zone confined to a sector of a first forming roll,

(ii) a second forming roll situated after the first forming roll, being situated at a lower level than the first forming roll, and also arranged to curve the twin-wire zone thereabout to become

(a) substantially horizontal,

(b) slightly upwardly inclined, or

(c) slightly downwardly inclined, and

(iii) a third forming element fitted after said second forming roll, after which the twin-wire forming zone ends.

More specifically, the first forming roll has a large diameter and the second forming roll has a diameter

substantially smaller than the diameter of the first forming roll, with the first forming roll being mounted on a frame of a lower wire unit, and magnitude of the sector of the first forming roll being less than about 90°. The first forming roll also comprises a suction zone situated within the sector thereof, with the second forming roll also having a sector for the curving of the twin-wire zone thereabout, which is less than about 90°. Furthermore, the third forming element is

(1) a forming shoe fitted inside a lower wire loop, mounted on the frame of the lower wire unit, and having a ribbed deck with a relatively large curve radius, or  
(2) a combination of deflectors situated in an upper wire loop and in the lower wire loop.

The twin wire zone is preferably arranged to direct a web formed therein upon a lower wire forming the lower wire loop after the twin-wire zone ends. Preferably, the second forming roll comprises a hollow-face, and the first and second forming rolls are arranged with respect to one another to direct the twin-wire zone as a substantially straight downward run from the first forming roll to the second forming roll. The former comprises a lower wire and an upper wire guided by guide rolls, with the lower and upper wires being arranged to both run over the first forming roll and define a forming gap thereat, into which a slice part of a head box is arranged to feed a pulp suspension jet.

Accordingly, in view of achieving the objects stated above and those which will become apparent below, the present invention is principally characterized by a former comprising a twin-wire forming zone, which comprises the forming members and forming zones situated in the sequence give below:

(a) a downwardly curved forming zone, which is confined to the sector of a large-diameter forming roll mounted on the frame of the lower wire unit, the magnitude of this sector being within the range of  $\alpha < 90^\circ$  and the suction zone of the first forming roll being situated within the area of this sector;

(b) a second forming roll which is preferably provided with a hollow face, and onto which the wires arrive from the first forming roll preferably as a straight downwardly run, with the diameter of the second forming roll being substantially smaller than the diameter of the first forming roll, the second forming roll being placed at a lower level than the first forming roll, and the twin-wire forming zone being curved on the second forming roll within a certain sector thereof of less than 90° so as to become substantially horizontal or slightly upwardly or downwardly inclined; and

(c) a forming shoe provided with a ribbed deck and fitted after the second forming roll inside the lower-wire loop, mounted on the frame construction of the lower wire unit, this forming shoe having a relatively large curve radius, or a corresponding deflector combination after which the twin-forming zone ends and the web is arranged to follow along with the lower wire.

A number of advantages of different directions are carried into effect at the same time by means of the present invention. In the invention, the first forming roll can be supported and journaled on the frame of the lower wire unit, in the case of rebuilding of the existing fourdrinier wire part on the frame, which is an essential advantage as compared, e.g., with the construction of the SPEED-FORMER HHS, in which the corresponding forming roll is supported on the upper wire unit.

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In the construction in accordance with the present invention, the first forming roll is not susceptible to being flooded, because its suction area is on an upper sector of the roll.

The footing constructions of the headbox must be made higher in the case of renewals with the present invention, there being usually adequate space available.

In addition to the principal constructional advantages noted above, the above process-technical objects related to web formation and dewatering are also obtained by means of the present invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in greater detail below with reference to an advantageous exemplary embodiment of the invention illustrated in the accompanying figure, in which

FIG. 1 is a schematic side view of a twin-wire former in accordance with the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The paper machine former illustrated in FIG. 1 comprises an upper wire unit and a lower wire unit. The upper-wire unit includes an upper wire 10 guided by guide rolls 11, 12, 13 and by forming rolls 21, 15, as well as by a deck 26 of a forming shoe 25. The upper-wire unit further includes frame constructions (not illustrated) and water draining troughs 14, 16.

The lower-wire unit includes a lower wire 20 guided by the forming rolls 21, 15, by the forming shoe 25, and by dewatering members 27, 28 and guide rolls 29 and 32. The lower-wire unit includes a frame, of which a frame part 35 is illustrated in FIG. 1. Bearing supports 23 of the first forming roll 21 are attached on the frame part 35.

When the present invention is applied to modernizing existing fourdrinier formers, it is to a very great extent possible to make use of the existing frame part of the fourdrinier wire, of the draining equipment at the rear end thereof, of rolls 29 and 32, as well as of pick-up roll 30. In the present invention, the forming roll 21 is expressly supported and journaled on the frame part 35 by means of the bearing supports 23, such construction being considerably more advantageous than a construction in which a roll corresponding to the roll 21 would have to be supported and journaled in conjunction with the upper-wire unit.

The upper wire 10 and the lower wire 20 define a twin-forming zone A-B between the same, with water being removed out of the web W that is being formed within this zone through both wires 10 and 20.

After the twin-wire forming zone A-B, starting from a suction box 27 or equivalent, the web W follows the lower wire 20 which thus acts as a so-called carrying wire and carries the web W over a suction zone 29a of the roll 29 to a detaching point P, where the web W is transferred onto a suction zone 30a of the pick-up roll 30 and onto a pick-up felt 31 which carries the web W further to a press section (not illustrated).

The twin-wire forming zone A-B is preceded by a forming gap G which is defined from below by an upper quarter of the forming roll 21 over which the lower wire 20 runs, as well as by a straight run 10a of the upper wire 10 which runs from the guide roll 11 onto the forming roll 21 and onto a pulp web that is being formed. A pulp jet J is fed into the forming gap G

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through a slice part 42 of a head box 41 situated on a stand 40.

After the forming gap G, the twin-wire zone A-B is curved downwardly on a sector a of the forming roll 21. A suction zone 21a of the forming roll 21 is situated substantially within this sector a, this suction zone 21a being defined by laths 22 of a suction chamber which operate against an inner face of the perforated roll mantle. Dewatering takes place mostly through the upper wire 10 on the sector a of the roll 21. Pressure formed between the wires is maintained at an equilibrium by the upper-wire tensioning pressure  $p=2T_1/D_1$  ( $T_1$ =tensioning of the wire 10). The centrifugal force promotes the draining of water towards the trough 14. Some water may also drain through the lower wire 20 towards the suction zone 21a, partly because of the negative pressure prevailing therein. The amount of this latter dewatering depends upon the level of negative pressure in the suction zone 21a. This level can be regulated to a suitable level so as to adjust ratios of dewatering taking place through the upper wire 10 and the lower wire 20 on the sector a, in view of optimizing the formation of the web W.

The forming sector a is formed by a joint downwardly inclined run of the wires 10 and 20 onto the forming roll 15. On this run and inside a loop of the lower wire 20, there is one or several deflectors 24 which remove water out of the web W that is being formed.

The second forming roll 15 situated inside the loop of the upper wire 10, is a hollow-faced 15' (diameter  $D_2$ ) roll 15 on whose sector b the run of the wires 10, 20 and of the pulp web situated between the same, is turned and becomes substantially horizontal. On the sector b the water is drained by the effect of the lower-wire 20 tensioning pressure  $p=2D_2/T_2$  ( $T_2$ =tension of the wire 20) and aided by the centrifugal force, the water being drained substantially through the lower wire 20 and to a certain extent also into the hollow face 15' of the forming roll 15 from which the water is thrown into the trough 16.

The forming roll 15 is followed by a forming shoe 25 situated inside a loop of the lower wire 20, the forming shoe being most appropriately provided with a ribbed deck 26. In the direction of running of the wire 10, 20, the deck 26 has a relatively large curve radius R whose center of curvature is at a side of the lower wire 20 as illustrated.

The ribbed deck 26 of the forming shoe 25 is followed by a suction box 27 with a curved deck situated within the loop of the lower wire 20 and ensuring that the web W follows along with the lower wire 20. After the point B of detaching of the web W from the upper wire 10, there may be deflectors 28, dry suction boxes, or other corresponding dewatering members inside the loop of the lower wire 20.

The forming shoe 25 may be substituted with a corresponding deflector combination. Of such possible deflectors, deflector 17 situated inside the upper-wire loop 10 and deflectors 37 situated inside the lower wire loop 20 are illustrated by means of dashed lines in the figure. The deflector 17 and 37 can be alternately situated, preferably so that the twin-wire forming zone guided by the same runs along a very gently meandering, substantially sine-shaped path.

When a forming shoe 25 is used, water is drained principally by the effect of the curve radius R through the upper wire 10 into the trough 16, as well as to a



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certain extent towards the ribbed deck 26 of the shoe 25 being aided by gravity and, if necessary, by suction. The ribbed deck 26 gives the web pressure impulses which improve its formation.

Concerning the different dimensional proportions of the former described above, it can be ascertained that the forming roll 21 or corresponding cylinder has quite a large diameter  $D_1$ , which is as a rule within a range of  $D_1$ =about 800–2000 mm., most appropriately within a range of  $D_1$ =about 1200–1600 mm.

The forming roll 15 that follows after the forming roll 21 has a diameter  $D_2$  which is considerably smaller than the diameter  $D_1$ . The diameter  $D_2$  of the roll 15 is as a rule within the range of  $D_2$ =about 700–1200 mm., most appropriately within the range of  $D_2$ =about 900–1000 mm.

The twin-wire zone sector a defined on the forming roll 21 in accordance with the present invention, has a width of a  $\alpha$  about 90°, preferably  $\alpha$ =about 40°–70° and most preferably  $\alpha$ =about 60°. The turning sector b of the forming roll 15 provided with a hollow fac 15' is substantially equally as large as the sector a of the first forming roll 21 which, as a rule, means that the sector a begins at a topmost point of the roll 21, and the twin-wire zone continues on from the roll 15 to the forming shoe 25 as substantially horizontal.

After the roll 15, the forming zone is substantially horizontal additionally because in this manner it is possible to utilize the frame constructions and the draining equipment of the existing wire part as advantageously as possible. Thus, it is preferred that in the case of rebuilding, the plane of the wire in an existing fourdrinier former joins the plane T-T illustrated in the accompanying FIG. 1. This construction is also advantageous from the point of view that bearing supports 23 of the first forming roll 21 can be mounted on the frame constructions of the existing wire part, most advantageously so that the entire roll 21 is situated above the plane T-T. In such a manner, the stand 40 of the head box 41 must be substantially raised by the dimension of the diameter  $D_1$  of the roll 21.

The curve radius R of the forming shoe 25 is, as a rule, within a range of  $R$ =about 2000–5000 mm., most appropriately  $R$ =about 3000 mm. The length of the twin-wire zone A-B is as a rule within a range of about 5–8 m.

An axis of rotation of the forming roll 15 is most appropriately at a level somewhat lower than an axis of rotation of the forming roll 21. The forming roll 21 is not susceptible to being flooded, because its suction sector 21a is situated on the upper half of the roll 21.

The overall geometry of the former is most appropriately such that the pulp jet J is discharged from the slice part 42 of the head box 41 as slightly upwardly inclined or substantially horizontally, and such that after the end point B of the twin-wire zone, the run of the lower wire 20 is substantially horizontal.

Various details of the present invention may vary within the scope of the inventive concepts set forth above which have been presented for the sake of example only. In other words, the preceding description of the present invention is merely exemplary, and is not intended to limit the scope thereof in any way.

What is claimed is:

1. A twin-wire former for a paper machine, having a twin-wire forming zone comprising, in the following sequence of twin-wire run,

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- (i) a downwardly curved forming zone confined to a sector of a first forming roll,
  - (ii) said twin wire run comprising a lower wire loop unit and an upper wire loop unit guided by guide rolls, the lower and upper wires being arranged to both run over said first forming roll and define a forming gap thereat, into which a slice part of a headbox is arranged to feed a pulp suspension jet,
  - (iii) a second forming roll situated after said first forming roll, being situated at a lower level than said first forming roll, and also arranged to curve the twin-wire run thereabout to become either
    - (a) substantially horizontal,
    - (b) slightly upwardly inclined, or
    - (c) slightly downwardly inclined, and
  - (iv) a third forming element fitted after said second forming roll, said third forming element being either
    - (1) a forming shoe fitted inside the lower wire loop, mounted on the frame of the lower wire unit, and having a ribbed deck with a relatively large curved radius, or
    - (2) a combination of deflectors situated in the upper wire loop and in the lower wire loop after which the twin-wire forming zone ends and wherein said first forming roll has a large diameter and said second forming roll has a diameter substantially smaller than the diameter of said first forming roll,
- said first forming roll is mounted on a frame of the lower wire unit and is located within the lower wire unit, magnitude of said sector of said first forming roll is less than about 90°, and said second forming roll has a sector for the curving of the twin-wire zone which is less than about 90°.

2. The twin-wire former of claim 1, wherein said first forming roll comprises a suction zone situated within said sector thereof,

and said twin-wire zone is arranged to direct a web formed therein upon the lower wire forming the lower wire loop after said twin-wire zone ends.

3. The twin-wire former of claim 2, wherein said second forming roll comprises a hollow-face, and said first and second forming rolls are arranged with respect to one another to direct the twin-wire zone as a substantially straight downward run from said first forming roll to said second forming roll.

4. The twin-wire former of claim 1, wherein said twin-wire zone is arranged to start in an area of a top-most point on said first forming roll.

5. The twin-wire former of claim 2, wherein the magnitude of said sector of said first forming roll is from about 40° to 70°, and

the magnitude of said sector of said second forming roll is substantially equal to said first forming roll sector magnitude.

6. The twin-wire former of claim 5, wherein the magnitude of said first forming roll sector is about 60°.

7. The twin-wire former of claim 2, wherein the diameter of said first forming roll is about 800–2,000 mm. and the diameter of the said second forming roll is about 700–1200 mm.

8. The twin-wire former of claim 7, wherein the diameter of said first forming roll is about 1200–1600 mm.,

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and the diameter of said second forming roll is about 900-1000 mm.

9. The twin-wire former of claim 2, wherein said third forming element is said forming shoe with said curve radius of said ribbed deck thereof being about 2000 to 5000 mm

10. The twin-wire former of claim 9, wherein said radius is about 3,000 mm.

11. The twin-wire former of claim 3, additionally comprising

at least one dewatering deflector situated adjacent said substantially straight downward run from said first forming roll to said second forming roll.

12. The twin-wire former of claim 11, wherein said at least one deflector is situated within the lower wire loop.

13. The twin-wire former of claim 2, wherein said third forming element is said deflectors which are ar-

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ranged to guide said twin-wire zone along a gently-meandering, sine-shaped path.

14. The twin-wire former of claim 2, wherein the frame of the lower wire unit is a frame of a fourdrinier wire unit, additionally comprising draining equipment situated within the lower wire loop which is draining equipment of the fourdrinier wire unit, and said twin-wire zone is arranged to end such that a plane of the lower wire subsequently carrying the web substantially joins a plane of an upper run of a fourdrinier wire of the fourdrinier unit, said former constituting a rebuilding of existing fourdrinier wire parts.

15. The twin-wire former of claim 14, wherein said first forming roll is journaled and supported upon the frame by means of bearing supports.

16. The twin-wire former of claim 15, wherein said first forming roll is journaled to remain entirely above the plane of the upper run of the fourdrinier wire.

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# **EXHIBIT K**





130-152 #18/BA/303 6/14/94  
FA-1875 CONT (14-285)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

6-14-94  
Serial Patent Application of

New York, New York

Rudolf Buck et al.

Date: May 23, 1994

Serial No.: 08/055,918

Group Art Unit: 1303

Filed: April 29, 1993

Examiner: Karen Hastings

For: TWIN WIRE FORMER

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

130  
INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to 37 C.F.R. §§1.97 and 1.98, applicants are submitting the following patent documents for consideration by the Examiner:

Patent Documents

1. European A 0 296 135
2. US A 4 532 008
3. German A 3 321 406
4. European A 0 306 759
5. US A 4 769 111
6. German A 3 628 282
7. German A 3 329 833
8. WO 86/04368
9. European A 0 289 445

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These documents were cited in an opposition proceeding in the European Patent Office regarding a counterpart of the above-identified application.

The relevance of the documents as alleged by the opposer is as follows:

1. Patent document 1 has been cited to show a twin wire former in which in the first section of the twin wire zone the wires 10 and 20 travel over a rotating forming cylinder 21. Dewatering strips or battens 111 and 112 rest against the wire 20 in the upper wire loop and battens 101, 102 and 103 rest against the belt in the lower wire loop. Although the battens can be adjusted perpendicular to the plane of the wire, the battens are rigidly and not flexibly supported. In the third section of the twin zone the wire belts travel over stationary dewatering components constituted by a forming shoe 14 and a flatbox 16.

Among the differences recognized by the opposer are a) that the suspension in the twin wire former which is the subject of the above-identified application is fed directly into the intake gap whereas in patent document 1, a single wire preliminary dewatering part is provided upstream of this gap (i.e., the former in patent document 1 is a hybrid former), and b) the dewatering battens in one of the two wire belts of the invention of the present application are flexibly supported whereas no such flexible support is present in the former disclosed in patent document 1.

2. Patent document 2 was cited for the same reasons advanced above in connection with patent document 1 and has the same deficiencies. In particular, in patent document 2 in the first section of the twin wire zone two wires travel over a dewatering element ("foil box") 22' with a curved top. In this section, the wire belts create a wedge-shaped intake gap. In the second section of the twin wire zone, several dewatering battens 52 with positions that can be adjusted rest against a wire belt in the upper wire loop and several dewatering battens 50 rest against the wire belt in the lower wire loop. The upper and lower dewatering battens are mutually displaced along the wire. In the third section of the twin wire zone, the belts travel over a dewatering component formed of a flat box ("suction box") 85.

Again, as in the case of patent document 1, patent document 2 discloses a hybrid twin wire former in which there is a single wire preliminary dewatering section upstream of the twin

wire zone and also discloses rigidly supported battens or dewatering strips.

3. Patent document 3 was cited to show a twin wire former in which the stock is introduced into an intake gap.

4. Patent documents 4, 5 and 6 have been cited to show flexibly supported battens in a twin wire former. The battens, however, are not displaced as set forth in applicants' invention. Additionally, the twin wire formers of documents 4, 5 and 6 are hybrid twin wire formers having respective single wire dewatering sections upstream of the twin wire zone.

5. Patent documents 7, 8 and 9 were cited as showing the state of the art. However, it is noted that the characteristic of direct introduction of suspension to the wedge-shaped intake gap from the head box is missing, as is any disclosure regarding use of battens and of course, any disclosure regarding the positioning or flexibility of the battens.

#### Additional Information

In addition to the patent documents noted above, opposer also cited the machine shown in Attachments A and B which opposer alleges was manufactured by opposer, Valmet Paper Machinery, Inc. of Helsinki, Finland and shipped to the James River Corporation of Clatskanie, Oregon. According to opposer, the twin wire former illustrated in Attachments A and B was operated for the first time on February 1, 1989. The various components of the twin wire former in Attachment B and C are assigned the same reference numerals used to specify the allegedly similar components of the embodiments set forth in applicants' application. Attachment B illustrates in larger scale the detail designated X of Attachment A.

The characteristics of the twin-wire former illustrated in Attachments A and B according to opposer are as follows:

"Two wire belts 11 and 12 together constitute a twin-wire part.

In the first section of the twin-wire part is a curved dewatering component in the form of a rotating cylinder 40, which

wire belts 11 and 12 travel over. Between the two wire belts 11 and 12 in this first section is a wedge-shaped stock-intake gap 15. Upstream of stock-intake gap 15 is a headbox 10, which introduces the suspension directly into gap 15.

In another section downstream of the first section, two dewatering battens 27 rest against wire belt 11. Many dewatering battens 28 also rest against wire belt 12 in the second section of the twin-wire part. The more upstream batten 27 rests against the wire belt 11 between facing battens 28. The more downstream batten 27 rests against belt 11 downstream of the most downstream batten 28. Battens 27 and 28 are accordingly mutually displaced along the wire.

In a third section of the twin-wire part, wire belts 11 and 12 travel over three stationary dewatering components in the form of flatboxes 31.

The structure of and means of support for battens 27 is illustrated in detail in Attachment B. Batten 27 is secured to a support that pivots on a component secured to the overall device. Between that component and the support is a pneumatically pressurized hose. The forces transmitted to the support by the hose, downward in Attachment B, shift batten 27 into the position represented by the dot-and-dash lines. From this position the batten can be raised into the position represented by the continuous lines in opposition to the force exerted by the hose. Batten 27 is accordingly flexibly supported. This is true of both the battens 27 illustrated in Attachment A."

In connection with the former illustrated in Attachments A and B, applicants would like to point out that of the two upper battens 27, the first batten 27 lies opposite the lower batten 28 in the lower wire loop and at least partly overlaps. Accordingly, the battens 27 and 28 are not offset and not in opposing relationship. The second batten 27 is located so far away from the bank of battens 28 that there is no cooperation between the second batten 27 and the bank of battens 28. Indeed, the second batten 27 is so far removed from the lower battens 28

that in effect one could consider it to be located outside of the second section as defined in applicants' claims.

In addition, it is proposed to amend applicants' claims to specify that the last one of the second drainage strips (the fixed strips 28) are located downstream of the last one of the first drainage strips (i.e. the flexibly supported strips 27). In contrast, assuming arguendo that the second batten 27 or alleged flexible strip of the former of Attachments A and B is considered to be part of the second section, it is located downstream of the last one of the fixed battens 28 and, therefore, does not meet this added limitation of applicants' claims but, instead, teaches away therefrom.

Turning now to the question of whether the twin wire former of Attachments B and C is prior art, applicants note that other than opposer's allegation, no proof has been offered nor is presently available to applicants regarding whether the twin wire former shown in Attachments A and B is the same as the twin wire former which it is alleged was put into use by James River Corporation on February 1, 1989, nor are there any facts available to applicants from which applicants can determine that such use was either a public use or that such wire former had been sold or was on sale. In any event, applicants believe that they patentably distinguishes over the twin former in Attachments A and B as discussed above. In addition, there is no teaching in the wire former of Attachments A and B of the thickness or spacing of the draining strips as set forth in applicants' claim 16.

#### Certification

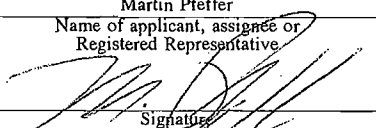
I certify that each item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.

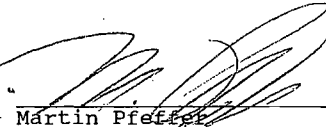
Petition

Applicants hereby petition pursuant to 37 C.F.R. \$1.97(d)(1)(ii) that this Information Disclosure Statement be considered. A check in the amount of \$130 is enclosed for the petition fee required by 37 C.F.R. \$1.97(d)(1)(iii) and \$1.17(i)(1). If any additional fees are due, you are authorized to charge the same to the undersigned's deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on May 23, 1994:

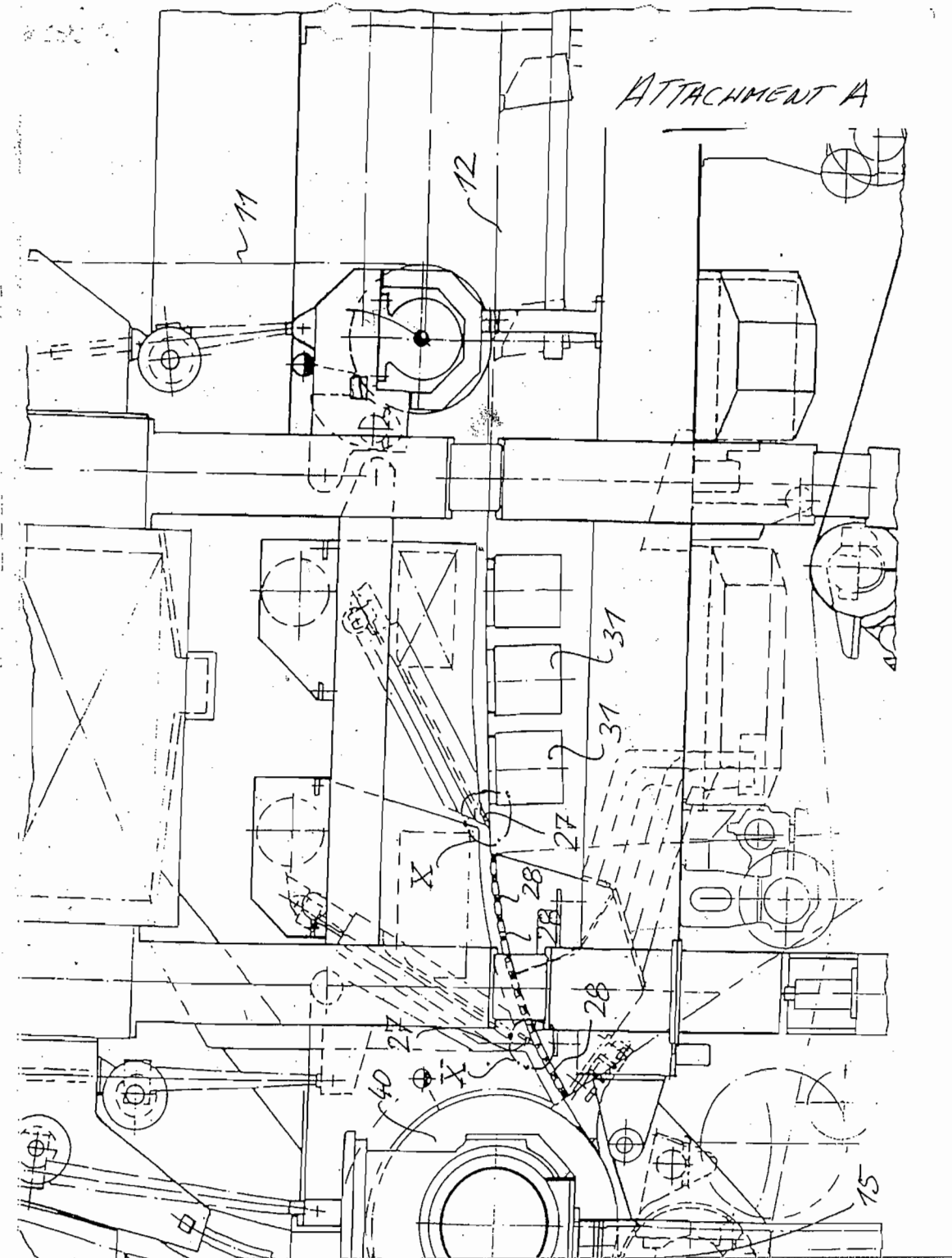
Respectfully submitted,

Martin Pfeffer  
Name of applicant, assignee or  
Registered Representative  
  
Signature  
May 23, 1994  
Date of Signature

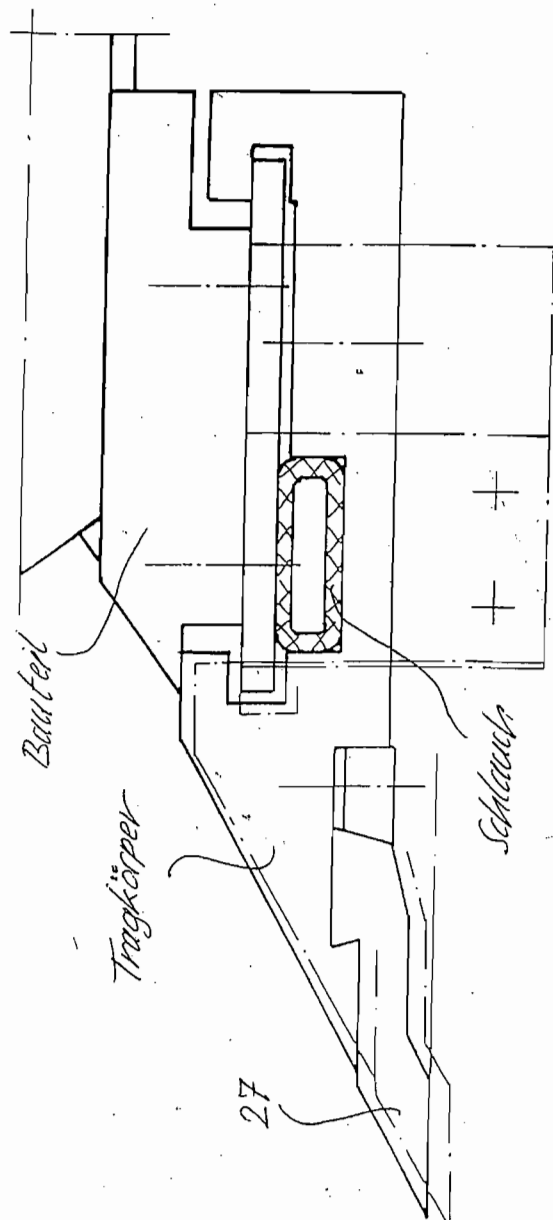
  
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MP/lrc/ss





ATTACHMENT B



# **EXHIBIT L**

**United States Patent** [19]

Nevalainen et al.

[11] **Patent Number:** 4,769,111[45] **Date of Patent:** Sep. 6, 1988

[54] **SUPPORT APPARATUS FOR A DEWATERING UNIT IN THE WEB FORMING SECTION OF A PAPER MACHINE**

[75] **Inventors:** Taisto A. Nevalainen, Imatra; Tapani E. Nyman, Karhula, both of Finland

[73] **Assignee:** A. Ahlstrom Corporation, Karhula, Finland

[21] **Appl. No.:** 69,145

[22] **Filed:** Jul. 2, 1987

[30] **Foreign Application Priority Data**

Jul. 2, 1986 [FI] Finland ..... 862809

[51] **Int. Cl.:** D21F 1/36

[52] **U.S. Cl.:** 162/351; 162/300; 162/301; 162/352; 162/354; 162/374

[58] **Field of Search:** 162/272, 352, 374, 365, 162/366, 354, 355, 300, 301, 351

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

|           |         |              |         |
|-----------|---------|--------------|---------|
| 3,017,930 | 1/1962  | Dunlap       | 162/352 |
| 3,104,223 | 9/1963  | Kasuya       | 162/374 |
| 3,864,207 | 2/1975  | Ekberg       | 162/365 |
| 3,994,774 | 11/1976 | Halme et al. | 162/273 |
| 4,523,978 | 6/1985  | Pullinen     | 162/352 |

|           |         |                |         |
|-----------|---------|----------------|---------|
| 4,559,105 | 11/1985 | Sennett et al. | 162/352 |
| 4,623,429 | 11/1986 | Tissari        | 162/352 |

**FOREIGN PATENT DOCUMENTS**

|         |         |                      |
|---------|---------|----------------------|
| 3406217 | 10/1985 | Fed. Rep. of Germany |
| 69885   | 12/1985 | Finland              |

*Primary Examiner*—David L. Lacey

*Assistant Examiner*—K. M. Hastings

*Attorney, Agent, or Firm*—Nixon & Vanderhye

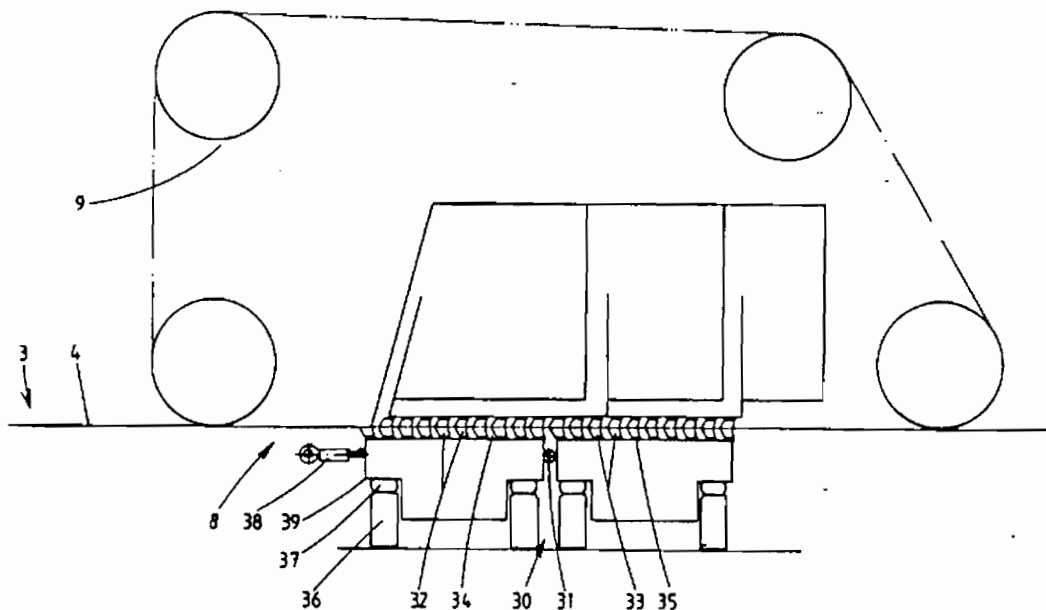
[57] **ABSTRACT**

The present invention relates to a support apparatus of a dewatering unit (30) below a bottom wire of the twin wire forming section of a paper or board machine.

The problem in known, corresponding arrangements has been insufficient crosswise stiffness of the dewatering unit and lack of adjustability.

The above-mentioned disadvantages have been eliminated or minimized by a support arrangement, characterized in that the dewatering unit (30) is supported on beams (36) transversely in view of the machine direction by means of a hose-like pressure-medium filled elements (37), which also allow a longitudinal adjustment of the dewatering unit by means of an adjusting element (38).

8 Claims, 2 Drawing Sheets



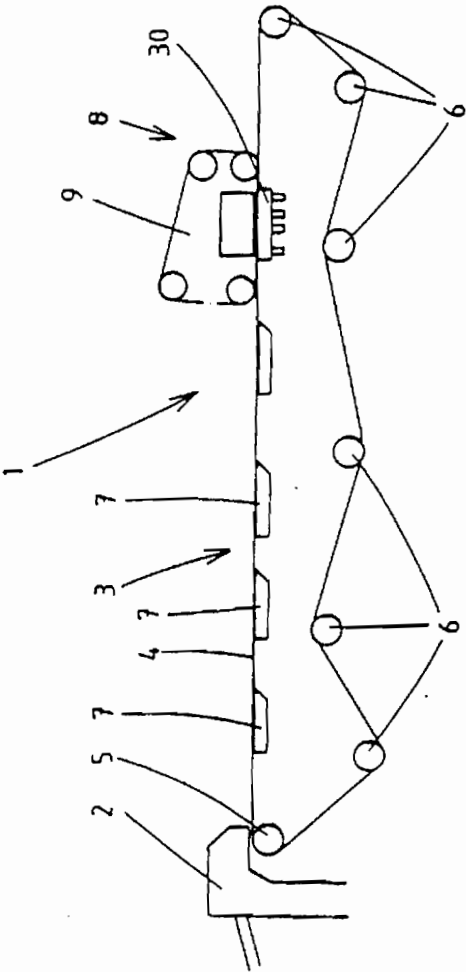


FIG. 1

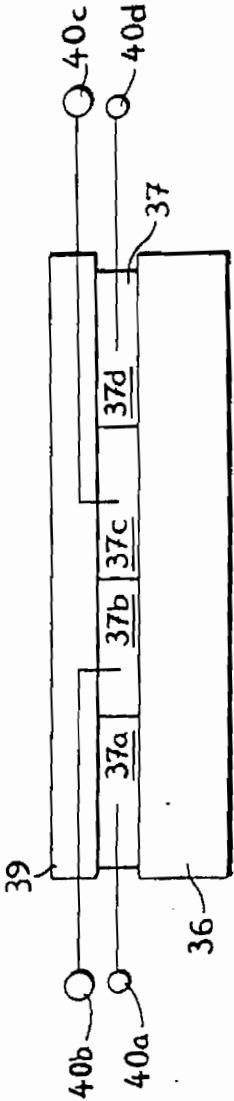
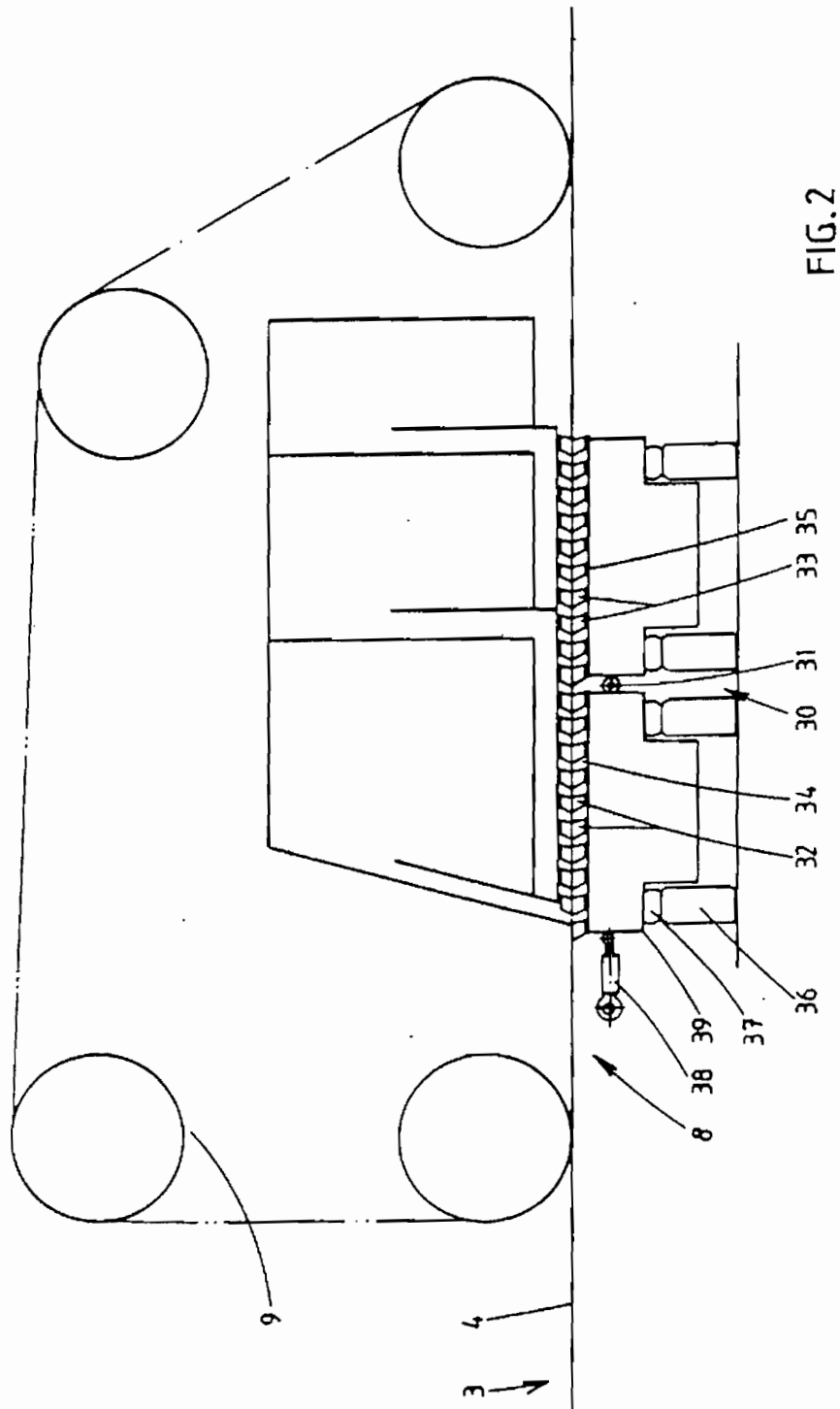


FIG. 3





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# **SUPPORT APPARATUS FOR A DEWATERING UNIT IN THE WEB FORMING SECTION OF A PAPER MACHINE**

The present invention relates to support apparatus for a dewatering unit in the web-forming section of a paper machine and especially to the supporting of a dewatering unit below a bottom wire, said unit being used in connection with a twin wire former. This supporting method allows a wide range of adjustments to be made.

There are several known shoe constructions for the forming section of a twin wire former, most of which are stationary and quite stiff. Some vertically adjustable constructions have, however, been disclosed, for example in U.S. Pat. No. 3,994,774, FI Pat. No. 69885 and DE Pat. No. 3406217.

U.S. Pat. No. 3,994,774, although it relates to a so-called gap former, discloses vertical adjustment of the lower dewatering unit by means of pressure-medium filled cylinders disposed in the corners of said lower unit. Such arrangement enables stepless adjustment of the inclination of the lower dewatering unit.

FI Pat. No. 69885 discloses a forming shoe for a twin wire forming section in a paper machine, said shoe comprising a number of pivoted blade rows disposed transversely with respect to the forming shoe. The height of each forming shoe is separately adjustable in order to provide a leading surface of a desired form. Articulation of the blade rows allows forming of a curved leading surface comprising several partial plane-like surfaces.

In DE Pat. No. 3406217, the cover of a dewatering unit below a bottom wire is formed of lists, each of which is adjustable to compress the web against the dewatering unit above the bottom wire at pressure unequal to that of other rows. In the embodiment disclosed in said patent, the rows are attached to a flexible membrane, below which a desired pressure prevails. Dividing the pressurized space below the membrane into separate chambers makes it possible to change the state of pressure in the chambers, which enables the compressive effect on the web to be adjusted. The more chambers the pressurized space is divided into, the greater the number of unequal compressive pressures that can be used.

The above described, relatively advanced arrangements have some disadvantages that cannot be eliminated because of their constructions. Neither is it possible to apply the newst technique in them such as, for example, provision of dewatering elements, disposed on different side of the web, that are adjustable with respect to one another in the longitudinal direction of the web.

Although the arrangement as disclosed in U.S. Pat. No. 3,994,774 allows vertical adjustment in the lower dewatering unit, such arrangement is not readily applicable to said unit. Disposition of pressure-medium filled cylinders in the corners of the lower unit also sets too high demands on the stiffness of said unit, at least if the width of the unit exceeds five meters.

Although every blade can be vertically adjusted independently of each other if FI Pat. No. 69885, it seems unlikely that such an adjustment could be made during operation or that such a unit would be adjustable in the direction of the web. Furthermore, in view of a wide paper machine, lack of stiffness constitutes a problem

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also in this arrangement if said type of shoe is used as a counterpart of the upper dewatering unit.

Thirdly, the apparatus as disclosed in DE Pat. No. 3406217 has some disadvantages even though it is highly developed. Due to a complicated pressure-medium chamber and especially due to its adjustment and feed equipment, it is hard to imagine said apparatus being transferable in the direction of the web. It is also highly probable that if said arrangement were applied as a counterunit of a suction box, the cover of which is formed of foils, it would not function reliably because of a flexible attachment of the foils to the membrane covering the pressure-medium filled chamber. In that case, the foil/foils would most probably vibrate due to pressure pulses, thus not achieving the advantages that can be reached by means of stationary, fixed lists.

It is an object of the present invention to provide a dewatering unit and means of supporting thereof, which together eliminate or minimize the defects discovered in known arrangements. The result of the invention is a dewatering unit with means of support, which unit is readily and in a diversified manner adjustable, and is simple and reliable in operation, characterized in that the dewatering unit below the bottom wire is supported by hose-like pressure elements on beams disposed transversely with respect to the machine direction, said pressure elements enabling the dewatering unit to be adjusted both vertically and horizontally. Other characteristics of the apparatus are disclosed in the accompanying claims.

The apparatus will be further described, by way of example, with reference to the accompanying drawings, in which

FIG. 1 is an overall schematic elevational view of the wet end of a paper machine to which the support apparatus according to the invention is applied; and

FIG. 2 is a detailed side view of the apparatus in accordance with the invention which may be regarded as an enlarged fragmentary detail of FIG. 1.

FIG. 3 is an end elevational view of the support apparatus hereof.

The apparatus according to the invention is primarily intended to be used in a fourdrinier machine 1, as shown in FIG. 1. In its simplest form, the wet end of the fourdrinier machine 1 comprises a headbox 2 and a fourdrinier wire section 3, said wire section comprising and endless mesh loop or "wire" 4, breast roll 5, other rolls and rollers 6 and dewatering elements 7. The rear or downstream end of the fourdrinier wire section 3, i.e. a so-called web forming section 8, comprises an upper or "on-top" unit 9 above the web and a dewatering unit 30 below the fourdrinier wire or lower wire 3.

In the arrangement as shown in FIG. 2, the dewatering unit 30 of the web-forming section of the paper machine comprises two covers 34 and 35 formed by a row of rod-like elements 32 and 33 extending transversely of the wires, said covers being united by a joint 31. The covers 34 and 35 are supported on beams 36, said beams extending transversely with respect to the direction of extension of the machine and being attached to the machine frame through pressure-medium (compressed air, hydraulic fluid) filled expandable, flexible vessel means of hose-like elements 37 so as to enable longitudinal adjustment of the angular position of the covers 34 and 35 with respect to the machine. In other words, the pressure exerted by the covers 34 and 35 on the bottom wire 4 can be changed. The adjustability is achieved by the pressure adjustment of each hose-like

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pressure element 37 being independent of other elements 37. Furthermore, to improve the adjustability of the dewatering unit 30, the covers 34 and 35 are displaceably engaged or supported by an adjustable means of element 38 adjustable longitudinally with respect to the direction of extension of the machine, said element being attached to the machine frame at one end and to the cover 34 at its other end. Any other elements for the longitudinal adjustment are unnecessary because hose-like elements 37 provide a sufficient adjusting allowance both horizontally and vertically. if required, distances between various covers may be adjusted.

The advantage of hose-like elements 37 is that, even though the beams 36, disposed transversely with regard to the machine, become bent due to the load on them, the hose-like elements 37 may be adjusted to keep the covers 34 and 35 in plane-like disposition. The hoses 37 also allow the covers 34 and 35 to be lowered to such an extent that, for example, changing of the rod-like elements 32 or 33 is facilitated. Furthermore, it is possible to make the hose-like elements 37 from a plurality of parts in the longitudinal direction of the beam 36, i.e. divide the hoses into a plurality of shorter parts, each of which can be independently pressure-adjusted. For example, as illustrated in FIG. 3, hose 37 is divided into a plurality of compartments 37a-37d in its longitudinal direction transverse to the direction of paper extension. Each compartment 37a-37d is a separate inlet pressurized fluid line under control of a discrete independently adjustable control valve 40a-40d. In this way, it is easier to adapt the form of the lower dewatering unit to that of the upper one.

If necessary, the pass of covers 34 and 35 can be limited by means of special limit plates 39 that prevent moving of the hose-like pressure element 37 from the top of the beam 36 during adjustments. Transverse movement of the covers 34 and 35 can be limited in many ways. It is possible, for example, to arrange slide surfaces on the side of the covers, said surfaces only allowing movement in the longitudinal direction with respect to the machine. Even though the above description illustrates a two-part cover of the dewatering unit 30, said cover can alternatively be made from one part or be assembled of several parts by joining them together. Also, even though the above description discloses the covers being composed of rod-like dewatering elements, they can be of any appropriate type. Furthermore, supporting of the sides adjacent to the covers 34 and 35 can be made so as to affect or achieve the joint between the covers.

Although in FIG. 2, the adjustable means 38 is illustrated as a pressure-medium filled cylinder, it may alternatively be a manual screw adjuster or any other appropriate adjusting device.

As can be seen from the above, by a simple construction and reliable operation the invention makes up a unit or whole, meeting all the objects required of. The above only discloses one preferred embodiment of the invention and is not intended to limit the invention from what is claimed in the accompanying claims.

We claim:

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1. In a dewatering unit of a paper machine extending in a longitudinal direction, said dewatering unit positioned below a lower endless mesh web of the paper machine and including first and second longitudinally spaced covers, each cover formed of dewatering elements, each cover having opposite ends spaced one from the other in the longitudinal direction of the machine extension, a support apparatus for said covers comprising:

10 a plurality of first means for supporting said first cover along its opposite ends thereof spaced longitudinally one from the other with each first supporting means extending transversely with respect to the direction of the extension of the paper machine; and

15 a plurality of second means for supporting said second cover along its opposite ends thereof spaced longitudinally one from the other with each said second supporting means extending transverse with respect to the direction of the extension of the paper machine, each said first and second supporting means including expansible flexible wall vessel means containing fluid under pressure and a beam disposed transversely with respect to the direction of extension of said paper machine, the expansible flexible wall vessel means of each end of said covers being supported on the corresponding beam; and joint means for joining said first and second covers one to the other, said expansible flexible wall vessel means supporting said covers through said joint means.

2. Apparatus according to claim 1 wherein each of said vessel means is divided into several compartments in a transverse direction.

3. Apparatus according to claim 2 including means for independently adjusting the pressure in each compartment of said vessel means.

4. Apparatus according to claim 1 wherein one of said vessel means is positioned on its corresponding beam to enable displacement of one of said covers longitudinally with respect to the direction of extension of the machine, said apparatus further including a stationary frame, and means connecting between said stationary frame and said one cover for displacing said one cover longitudinally.

5. Apparatus according to claim 4 wherein said displacing means is structured for being operable to displace both said first and second covers relative to said stationary frame.

6. Apparatus according to claim 5 wherein each of said vessel means is divided in a transverse direction into several parts.

7. Apparatus according to claim 6 including means for independently adjusting the pressure in each part of said vessel means.

8. Apparatus according to claim 1 wherein each of said first and second covers has four corners, said flexible wall vessel means being disposed adjacent each of the four corners of each said first and second cover, and means for adjusting the pressure of each said flexible wall vessel means adjacent each corner independently of one another.

\* . . . . \*

# **EXHIBIT M**



07/773965

09 Rec'd PCT/PTO 12 NOV 1991-9175 (PCT) (14-228)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Bück, Rudolf et al.

Date: November 12, 1991

Serial No.:

Group Art Unit:

Filed: October , 1991

Examiner:

For: TWIN WIRE FORMER

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Preliminary to the examination of the above-application  
and at the filing of this application, please amend the above  
application as follows:

IN THE SPECIFICATIONPage 1, before line 2, insert BACKGROUND OF THEINVENTION

line 7, delete the entire line and substitute

--the patent include a twin wire former for  
producing a fiber web and particularly a  
paper web from a fiber suspension. Two web  
forming wire belts, in the form of endless  
loops, travel together to form a twin wire  
zone. The web travels between and along  
the path of the wire belts through the twin  
wire zone. The twin wire zone has three  
sections and the elements in those three  
sections are described below. The patent  
describes features that--.

Page 4, before line 9, insert SUMMARY OF THEINVENTION--;

08 Rec'd PCT/PTC 06 1991 MAR

**BUNDESREPUBLIK DEUTSCHLAND**

PCT / E P 90 / 01313



02/773965  
REC'D 08 OCT 1990  
WIPO PCT

**PRIORITY DOCUMENT**

**Bescheinigung**

Die J.M. Voith GmbH in 7920 Heidenheim hat eine Patentanmeldung unter der Bezeichnung

"Doppelsieb-Former"

am 22. August 1989 beim Deutschen Patentamt eingereicht.

Die angehefteten Stücke sind eine richtige und genaue Wiedergabe der ursprünglichen Unterlagen dieser Patentanmeldung.

Die angeheftete Zusammenfassung, die der Anmeldung beizufügen, aber kein Bestandteil der Anmeldung ist, stimmt mit dem am 22. August 1989 eingereichten Original überein.

Die Anmeldung hat im Deutschen Patentamt vorläufig die Symbole D 21 F 1/00 und D 21 F 9/02 der Internationalen Patentklassifikation erhalten.

München, den 31. August 1990

Der Präsident des Deutschen Patentamts

Im Auftrag

R. Konvall

Zeichen: P 39 27 597.3

#3

|  |                           |  |  |
|--|---------------------------|--|--|
| Robert C. Faber<br>Ostrolenk, Faver, Gerb & Soffen<br>1180 Avenue of the Americas<br>New York, New York 10036-8403   |                           | UNITED STATES DESIGNATED/ELECTED<br>OFFICE (DO/EO/US)<br>NOTIFICATION OF ACCEPTANCE OF<br>APPLICATION UNDER 35 U.S.C. 371<br>AND 37 CFR 1.494 OR 1.495 |  |
|  |                           | Date of Mailing<br><b>30 MAY 1992</b>  |  |
|  |                           | File Reference<br>F-9175 PCT   |  |
| IDENTIFICATION OF THE INTERNATIONAL APPLICATION  |                           |  |  |
| International application Number   | International filing date | Priority date claimed  |  |
| PCT/EP90/01313   | 09 August 1990            | 22 August 1989   |  |
| Applicant for DO/EO/US   |                           |  |  |
| Rudolf, Buck et al.  |                           |  |  |
| NOTIFICATION   |                           |  |  |
| The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a <input checked="" type="checkbox"/> Designated Office, <input type="checkbox"/> Elected Office, has determined that the above identified international application has met the requirements of 35 U.S.C. 371 and 37 CFR <input checked="" type="checkbox"/> 1.494, <input type="checkbox"/> 1.495 and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office. |                           |  |  |
| The United States Serial Number assigned to the application and the relevant dates are:<br><u>07/773965</u> <u>12 Nov 91</u> <u>12 Nov 91</u>  |                           |  |  |
| U.S. NATIONAL SERIAL NO.    35 U.S.C. 102(e) DATE    DATE OF RECEIPT 35 U.S.C. 371 REQUIREMENTS  |                           |  |  |
| <input checked="" type="checkbox"/> A request for immediate examination under 35 U.S.C. 371 (f) was received on <u>12 Nov 91</u> and the application will be examined in turn.   |                           |  |  |
| <input type="checkbox"/> No request for immediate examination under 35 U.S.C. 371(f) was received. The application will not be processed or examined before the time limit set forth in either   |                           |  |  |
| <input type="checkbox"/> PCT Article 23 (Chapter I of the PCT), or <input type="checkbox"/> PCT Article 40 (Chapter II of the PCT) whichever is applicable.  |                           |  |  |
| UNITED STATES DESIGNATED/ELECTED OFFICE  |                           |  |  |
| ADDRESS ONLY:<br>COMMISSIONER OF PATENTS AND TRADEMARKS<br>Box PCT, Attn. DO/EO/US<br>Washington, D.C. 20231   |                           | AUTHORIZED OFFICER<br><b>REGINA WHITE</b> <i>Regina White</i><br>INTERNATIONAL DIVISION  |  |

 Form PCT/DO/EO/903 (U.S. Version) (April 1987)  
 sdj

U.S. DEPARTMENT OF COMMERCE - PTO

JFI0204413



line 17, delete entire line and substitute

--forth below. In particular, there is a respective drainage strip above each of the two wire belts in the second section of the twin wire zone, and at least one of the two drainage strips is supported resiliently against the respective wire belt while the other may or may not be resiliently supported, and typically is rigidly supported against the respective wire belt. Preferably, there are at least two of the drainage strips and often more against each of the wire belts. The drainage strips against one belt are offset along the path of the wire belts with respect to the drainage strips against the other belt, providing a zig zag or staggered array, and the drainage strips against at least one of the belts are resiliently supported.--

Page 5, line 18, delete "Claim 2";

at the end of the line insert --In particular, the drainage strips above each one of the wire belts are of a thickness along the path of the wire belts and the spacing between adjacent strips above each wire belt is a minimum of about three times the strip thickness.--

Page 6, before line 7, insert --BRIEF DESCRIPTION OF THE DRAWINGS--;

before line 12, insert --DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--

Page 8, line 9, change "12 and 13" to --11 and 12--;

IN THE CLAIMS:

Please cancel claims 1-12.

Please add claims 13-33 as follows:

*sub B12'G'*  
 13. A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

5 first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel, along the path through the twin wire zone;

10 the twin wire zone having a first section at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, the slot being adapted for receiving suspension directly from a head box; a curved drainage element in the first section, the  
 15 curved drainage element being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the  
 20 entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, at least one first drainage strip which is positioned at the  
 25 side of the first wire belt away from the second wire belt and is for contacting the first wire belt; in the second section, at least one second drainage strip which is positioned at the side of the second wire belt away from the first wire belt and is for contacting the second  
 30 wire belt; one of the first and second strips being shifted in position along the path of the wire belts with respect to the other of the first and second strips; means for resiliently supporting at least one of the first and second drainage strips against the respective  
 35 wire belt that that strip contacts;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element.

14. The twin wire former of claim 13, wherein in the second section of the twin wire zone, there are at least two of the first drainage strips at the first wire belt and spaced from each other along the path of the wire belts and there are at least two of the second drainage strips at the second wire belt and spaced from each other along the path of the wire belts, with the first drainage strips being shifted along the wire belt path with respect to the second drainage strips such that the first and second drainage strips alternate along the path of the wire belts;

at least one of the first drainage strips being resiliently supported against the first wire belt.

15. The twin wire former of claim 14, wherein each of the first and second wire belts is in the form of a respective endless wire loop; means guiding the wire loops to define the twin wire zone;

the first drainage strips being arranged in the first wire loop and the second drainage strips being arranged in the second wire loop.

16. The twin wire former of claim 14, wherein each of the drainage strips has a respective thickness in the direction along the path through the twin wire zone; neighboring ones of the first drainage strips are spaced a minimum distance of about three times the respective first strip thickness, and neighboring ones of the second

drainage strips are also spaced a minimum distance of about three times the respective second strip thickness.

17. The twin wire former of claim 14, further comprising means supporting each of the first drainage strips resiliently against the first wire belt; and support means supporting the second drainage strips rigidly against the second wire belt.

18. The twin wire former of claim 17, wherein the support means for the second drainage strips include means enabling adjustment of the position of the second drainage strips relative to the second wire belt to set the initial rigid position thereof.

19. The twin wire former of claim 18, wherein the support means for the second drainage strips comprise a support body to which the second drainage strips are supported, and bearings on which the support body is supported for enabling displacement of the support body across the path of the wire belts through the second section.

20. The twin wire former of claim 19, further comprising a respective individual support body supporting each of at least one of the first and second drainage strips individually, and means supporting the respective support body for each strip to be displaceable for enabling displacement of the respective strip transverse to the direction of the path of the wire belts.

21. The twin wire former of claim 14, further comprising a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective

5 support body of at least one of the first and second strips for enabling those strips to be moved transverse to the direction of the path of the wire belts.

22. In combination, the twin wire former of claim 13 and a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the headbox to the wedge shaped entrance slot of the first section of the twin wire zone.

7 23. The twin wire former of claim 13, further comprising a curved stationary forming shoe in the first section of the twin wire zone and following after and spaced from the curved drainage element along the path of the wire belts through the first section;

8  
O  
10 a first section strip disposed at the second wire belt and in the space between the curved drainage element and the curved stationary forming shoe in the first section of the twin wire zone along the path of the wire belts through the twin wire zone for enabling removal of water from the second wire belt.

8 24. The twin wire former of claim 13, wherein the stationary drainage element in the third section of the twin wire zone has a curvature that is curved in the same direction as the curvature of the curved drainage element in the first section of the twin wire zone.

9 25. The twin wire former of claim 24, further comprising an additional strip in the third section of the twin wire zone following the stationary drainage element and disposed against the other wire belt than the stationary drainage element.

10 26. The twin wire former of claim 24, wherein the curved drainage element in the first section of the

twin wire zone and the stationary drainage element in the third section of the twin wire zone are arranged against the same one of the first and second wire belts.

27. The twin wire former of claim 13, wherein the region of the twin wire zone following the entrance slot in the first ~~section~~ <sup>second</sup> of the twin wire zone and extending approximately to the stationary drainage element in the third section of the twin wire zone is free of rolls which curve the twin wire zone.

11 ~~28~~. The twin wire former of claim ~~13~~, further comprising a suction roll at one of the wire belts and located after the stationary drainage element along the path of the wire belts; both of the wire belts being wrapped about part of the circumference of the suction roll.

12 ~~29~~. The twin wire former of claim ~~13~~, wherein the means for directing the wire belts are positioned so that the twin wire zone rises substantially vertically upwardly in the path of travel of the wire belts through the twin wire zone.

13 ~~30~~. The twin wire former of claim ~~13~~, wherein the means for directing the wire belts are positioned so that the twin wire zone rises gradually upwardly along the path of travel of the wire belts through the twin wire zone at an incline with respect to the horizontal in the range of about 10° to 30°.

14 ~~31~~. The twin wire former of claim ~~13~~, wherein the first and the second drainage strips in the second section of the twin wire zone are both arranged one after the other along the path of the wire belts through the



5 twin wire zone so as to define a curvature for the path of the wire belts through the second section.

15 ~~15~~ 14. The twin wire former of claim ~~11~~ 14, wherein the first and second drainage strips are positioned in the second section of the twin wire zone to define a curvature for the path of the wire belts through the  
 5 second section of the twin wire zone that is opposite the curvature of the curved drainage element in the first section of the twin wire zone.

16 ~~16~~ 13. The twin wire former of claim ~~13~~ 13, wherein the means for directing the wire belts are positioned so that the twin wire zone extends substantially horizontally;  
 5 the curved drainage element in the first section of the twin wire zone being generally curved upwardly for giving the path of the wire belts through the first section of the twin wire zone a generally upward curve; the first and second drainage strips in the  
 10 second section of the twin wire zone being so positioned as to give the wire belts a generally downward curvature through at least part of the second section of the twin wire zone and the stationary drainage element in the third section of the twin wire zone is curved in a  
 15 direction to give the wire belts passing through the third section of the twin wire zone a generally upward curvature.--

#### REMARKS

Specification changes add section headings, correct typographical errors in element numbers which appeared in the original German language text and replace references to claim numbers with the applicable content of the claims named in the specification.

The original claims have been replaced with a new set of claims to improve the claim form for U.S. practice, to eliminate multiple dependent claims and to reduce the fees payable for the claims to the amount of the fee paid upon the filing of this application.

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office Addressee (mail label #624862909US) in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on November 12, 1991

Wilbert Brown

Name of applicant, assignee or  
Registered Representative

Wilbert Brown

Signature  
November 12, 1991

Date of Signature

Respectfully submitted,

Robert C. Faber

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RCF:cfr

# **EXHIBIT N**


**UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark Office**

 Address : COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

| SERIAL NUMBER | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
|---------------|-------------|----------------------|---------------------|
| 07773,965     | 11/12/91    | BUCK                 | R F-9175-PCT        |

EXAMINER

HASTINGS, K

 OSTROLENK, FABER, GERB AND SOFFEN  
1180 AVENUE OF THE AMERICAS  
NEW YORK, NY 10036-8403

ART UNIT

PAPER NUMBER

1303

DATE MAILED: 09/14/92

 This is a communication from the examiner in charge of your application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

*(Prelim Amendment)*  
*11-12-91*

☒ This application has been examined ☒ Responsive to communication filed on *11-12-91* ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s) 1 days from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

**Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:**

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input checked="" type="checkbox"/> Notice re Patent Drawing, PTO-948.        |
| 3. <input checked="" type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449.      | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152. |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474.     | 6. <input type="checkbox"/>  |

**Part II SUMMARY OF ACTION**

1. ☒ Claims 13-33 are pending in the application.  
Of the above, claims 1-12 are withdrawn from consideration.
2. ☒ Claims 1-12 have been cancelled.
3. ☐ Claims are allowed.
4. ☒ Claims 13-33 are rejected.
5. ☐ Claims are objected to.
6. ☐ Claims are subject to restriction or election requirement.
7. ☐ This application has been filed with Informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
8. ☐ Formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on \_\_\_\_\_ Under 37 C.F.R. 1.84 these drawings are ☐ acceptable ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-948).
10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on \_\_\_\_\_ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed on \_\_\_\_\_, has been ☐ approved ☐ disapproved (see explanation).
12. ☒ Acknowledgment is made of the claim for priority under U.S.C. 119. The certified copy has *PCT* ☒ been received ☐ not been received  
☐ been filed in parent application, serial no. \_\_\_\_\_; filed on \_\_\_\_\_
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

EXAMINER'S ACTION

Serial No. 773,965

-2-

Art Unit 1303

Claims 13-16, 20-33 are rejected under 35 U.S.C. § 112, first paragraph, as the disclosure is enabling only for claims limited to two (2) flexibly supported strips located opposite rigidly supported strips in a zig-zag line. Note page 15 "The minimum number of flexibly supported strips is two" (emphasis provided). Note also page 4, C. Therefore, the limitations of claims 14 and 17 should be put into claim 13. Furthermore, the claim 13 needs to be positively limited to a gap twin wire former without predrainage on a single wire - note page 4 lines 20-21. Thus the limitation of claim 22 should be placed into claim 13 and claim 13 amended to recite --, neither wire belt defines a single wire predrainage zone-- on line 8 after "zone". See M.P.E.P. §§ 706.03(n) and 706.03(z).

Claims 13-33 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13 is indefinite to failing to positively recite a twin wire zone with no single wire predrainage. Claim 13, line 13 "adapted" should be amended to --structured and arranged for--.

Claim 13 needs to recite at least two resiliently mounted drainage strips in a zig-zag line with other strips to be commensurate in

Serial No. 773,965

-3-

Art Unit 1303

scope with the specification.

It is not clear what claim 21 intends to claim versus claim 22. In claim 22 what does "those strips" refer to? Correction is necessary.

Claim 27 line 3 "second" should be --section--.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --  
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Claims 13-17, 28-30 are rejected under 35 U.S.C. § 102(b) as



Serial No. 773,965

-4-

Art Unit 1303

anticipated by or, in the alternative, under 35 U.S.C. § 103 as obvious over German-DE 3138133.

Fig. 3 of DE '133 shows every structural element claimed absent positive recitations of a headbox location and no single wire predrainage zone. Any differences that may be gleaned are obvious. Claim 22 is rejected under 35 U.S.C. § 103 as being unpatentable over DE '133 as applied to claim 13 above, and further in view of Armstrong et al which shows obviousness of a second headbox 15 before twin wire zone. Thus it would have been prima facie obvious to modify DE '133 to include a second headbox to deposit a second fiber ply onto the first fiber ply for the known advantages of multiply webs.

new  
paragraph

Claims 13-33 are rejected under 35 U.S.C. § 103 as being unpatentable over Tissari or Koski in view of DE '133.

Tissari, especially at Fig. 6, shows every feature claimed of claim 13+ except it does not specify that at least one of the strips 45 or 44 are "resiliently supported". Likewise Koski's sole Figure shows every feature of claim 13+ except at least one or more of deflectors 17, 37 being "resiliently mounted". However the artisan is well aware of the option and advantages of resiliently supported dewatering ribs/strips as evidenced by DE 3138133. Thus it would have been prima facie obvious to resiliently support at

Serial No. 773,965

-5-

Art Unit 1303

least one or more of the strips 44, 45 of Tissari or 17, 37 of Koski for the known advantages of same.

All dependent claims are shown or are prima facie obvious modifications to one of ordinary skill in the art. For example, the alternatives of individually mounting <sup>the drainage strips or mounting</sup> them in group is well known in the art. Providing adjustability in any or all directions of drainage elements is also well known in the art. Providing more drainage elements and/or strips (claim 23) would have been prima facie obvious for the known advantage of increased dewatering.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Schiel et al teaches in col. 1, Background that a typical twin wire former has resilient ledges.

Any inquiry concerning this communication should be directed to K. Hastings at telephone number (703) 308-0470.

Hastings/ad  
September 11, 1992

*KM Hastings*  
KAREN M. HASTINGS  
PRIMARY EXAMINER  
ART UNIT 133

9-14-92

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

| FORM PTO-892<br>(REV. 3-78)   |              | U.S. DEPARTMENT OF COMMERCE<br>PATENT AND TRADEMARK OFFICE |                  | SERIAL NO. 08/05598<br>773965 | GROUP/ART UNIT<br>1303 | ATTACHMENT<br>TO<br>PAPER<br>NUMBER<br>5 |                            |              |
|---|--------------|--|------------------|-------------------------------|------------------------|--|----------------------------|--------------|
| NOTICE OF REFERENCES CITED  |              |  |                  | APPLICANT(S)<br>Buck et al    |                        |  |                            |              |
| U.S. PATENT DOCUMENTS   |              |  |                  |                               |                        |  |                            |              |
| *   | DOCUMENT NO. | DATE   | NAME             | CLASS                         | SUB-CLASS              | FILING DATE IF APPROPRIATE               |                            |              |
| A   | 3994744      | 11-76  | Halmi et al      | 162                           | 352                    |  |                            |              |
| B   | 4425187      | 1-84   | Armstrong et al  | 162                           | 300                    |  |                            |              |
| C   | 4609435      | 9-86   | Tissac           | 162                           | 352                    |  |                            |              |
| D   | 4917766      | 4-90   | Kaivuranta et al | 162                           | 301                    | 6-88                                     |                            |              |
| E   | 4925531      | 5-90   | Kaski            | 162                           | 301                    | 5-89                                     |                            |              |
| F   | 5078835      | 1-92   | Schiel et al     | 162                           | 352                    |  |                            |              |
| G   |              |  |                  |                               |                        |  |                            |              |
| H   |              |  |                  |                               |                        |  |                            |              |
| I   |              |  |                  |                               |                        |  |                            |              |
| J   |              |  |                  |                               |                        |  |                            |              |
| K   |              |  |                  |                               |                        |  |                            |              |
| FOREIGN PATENT DOCUMENTS  |              |  |                  |                               |                        |  |                            |              |
| *   | DOCUMENT NO. | DATE   | COUNTRY          | NAME                          | CLASS                  | SUB-CLASS                                | PERTINENT<br>SHTS.<br>DWG. | PP.<br>SPEC. |
| L   | 880603       | 6-88   | Germany          | —                             | 162                    | 301                                      |                            |              |
| M   |              |  |                  |                               |                        |  |                            |              |
| N   |              |  |                  |                               |                        |  |                            |              |
| O   |              |  |                  |                               |                        |  |                            |              |
| P   |              |  |                  |                               |                        |  |                            |              |
| Q   |              |  |                  |                               |                        |  |                            |              |
| OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)   |              |  |                  |                               |                        |  |                            |              |
| R   |              |  |                  |                               |                        |  |                            |              |
| S   |              |  |                  |                               |                        |  |                            |              |
| T   |              |  |                  |                               |                        |  |                            |              |
| U   |              |  |                  |                               |                        |  |                            |              |
| EXAMINER<br>Hasty   |              |  | DATE<br>9-92     |                               |                        |  |                            |              |
| * A copy of this reference is not being furnished with this office action.<br>(See Manual of Patent Examining Procedure, section 707.05 (a).) |              |  |                  |                               |                        |  |                            |              |

TO SEPARATE: HC TOP AND BOTTOM EDGES SNAP APART AND DISCARD CARBON

FORM PTO-892 (REV. 3-78) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

SERIAL NO. 773965 GROUP/ART UNIT 1303 ATTACHMENT TO PAPER NUMBER 5

NOTICE OF REFERENCES CITED

APPLICANT(S) Duck et al

U.S. PATENT DOCUMENTS

| * | DOCUMENT NO. | DATE  | NAME            | CLASS | SUB-CLASS | FILING DATE IF APPROPRIATE |
|---|--------------|-------|-----------------|-------|-----------|----------------------------|
| A | 3994744      | 11-76 | Halmi et al     | 162   | 352       |                            |
| B | 4425187      | 1-84  | Armstrong et al | 162   | 300       |                            |
| C | 4609435      | 9-86  | Tissac          | 162   | 352       |                            |
| D | 4917766      | 11-90 | Koivumäki et al | 162   | 301       | 6-88                       |
| E | 4925531      | 5-90  | Kaski           | 162   | 301       | 5-89                       |
| F | 5078835      | 1-92  | Schuel et al    | 162   | 352       |                            |
| G |              |       |                 |       |           |                            |
| H |              |       |                 |       |           |                            |
| I |              |       |                 |       |           |                            |
| J |              |       |                 |       |           |                            |
| K |              |       |                 |       |           |                            |

FOREIGN PATENT DOCUMENTS

| * | DOCUMENT NO. | DATE | COUNTRY | NAME | CLASS | SUB-CLASS | PERTINENT SHTS. DWG. | PP. SPEC. |
|---|--------------|------|---------|------|-------|-----------|----------------------|-----------|
| L | 880603       | 6-88 | Germany | —    | 162   | 301       |                      |           |
| M |              |      |         |      |       |           |                      |           |
| N |              |      |         |      |       |           |                      |           |
| O |              |      |         |      |       |           |                      |           |
| P |              |      |         |      |       |           |                      |           |
| Q |              |      |         |      |       |           |                      |           |

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

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EXAMINER HAST DATE 9-92

\* A copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05 (a).)

# **EXHIBIT O**



F-9175 PCT (14-228)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

R. Buck, D. Egelhop et. al.

Serial No.: 07/773,965

Filed: November 12, 1991

For: TWIN-WIRE FORMER

Hon. Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

Date: November 19, 1992

Group Art Unit: 1303

Examiner: Hastings, J.

RECEIVED  
DEC 12 PM 1:34  
GROUP 130

AMENDMENT

Sir:

In response to the Office Action mailed September 14, 1992, please amend the above-identified application as follows:

IN THE CLAIMS:

Cancel claims 1/ and 2/.

Please amend the claims as follows:

13. (Amended) A twin-wire former for the production of a paper web from a fiber suspension, the twin wire former comprising:

first and second web forming wire belts, means for directing the wire belts to travel along a path together for forming a twin wire zone of the twin wire former, with the web between the wire belts as the wire belts travel along the path through the twin wire zone, neither wire belt defining a single wire predrainage zone;

the twin wire zone having a first section at the start of the path through the twin wire zone, means for supporting the belts for forming a wedge shaped entrance slot into the first section, a fiber suspension supplying headbox having an outlet placed and directed for delivering fiber suspension from the



headbox to the wedge shaped entrance slot of the first section of the twin wire zone [the slot being adapted for receiving suspension directly from a head box]; a curved drainage element in the first section, the curved drainage element being curved along the path of the belts through the twin wire zone, the curved drainage element being engaged by one of the wire belts, for curving the path of the belts around the curved drainage element after the entrance of the suspension into the entrance slot;

the twin wire zone having a second section following the first section along the path of the belts through the twin wire zone; in the second section, at least two [one] first drainage strips are [strip which is] positioned at the side of the first wire belt away from the second wire belt and are [is] for contacting the first wire belt; in the second section, at least one second drainage strip which is positioned at the side of the second wire belt away from the first wire belt and is for contacting the second wire belt; one of the first and second strips being shifted in position along the path of the wire belts with respect to the other of the first and second strips; first support means for resiliently supporting [at least one of] the first [and second] drainage strips against the respective wire belt that that strip contacts;

second support means supporting the at least one second drainage strip rigidly against the second wire belt;

the twin wire zone having a third section following the second section along the path of the wire belts through the twin wire zone; a stationary drainage element in the third section, for being engaged by one of the wire belts as the wire belts travel over the stationary drainage element.

14. (Amended) The twin wire former of claim 13, wherein [in the second section of the twin wire zone, there are at least two of the first drainage strips at the first wire belt and spaced from each other along the path of the wire belts and] there are at least two of the second drainage strips at the

B<sub>1</sub> second wire belt [and] spaced from each other along the path of the wire belts, with the first drainage strips being shifted along the wire belt path with respect to the second drainage strips such that the first and second drainage strips alternate along the path of the wire belts; and wherein  
the second support means supports the at least two  
second drainage strips rigidly against the second wire belt [at least one of the first drainage strips being resiliently supported against the first wire belt].

B<sub>2</sub> 21. (Amended) The twin wire former of claim 14, <sup>13</sup>  
wherein the first and second support means comprise [further comprising] a respective individual support body supporting each of the first and second drainage strips individually and means further supporting the respective support body of at least one of the first and second strips for enabling <sup>at least</sup> said one strip [those strips] to be moved transverse to the direction of the path of the wire belts.

Claim 21, line 3, change "second" to --section--.

#### REMARKS

Claims 13, 14, 21 and 27 have been amended to address the Examiner's rejection thereof under 35 U.S.C. §112. Claims 17 and 22 have been cancelled. Reconsideration of the application in view of the foregoing amendments and the following remarks is respectfully requested.

Claims 13-16, 20, 21 and 23-33 stand rejected under 35 U.S.C. §112, first paragraph. As noted, claims 13, 14, 21 and 27 have been amended and it is believed that the amendments have addressed all of the areas noted by the Examiner with one exception. Claim 13 has not been amended to require at least two rigidly supported strips. While the Examiner is correct that applicants' specification indicates on page 15 that the minimum number of flexibly supported strips is 2, it is also indicated on page 14, lines 29-31 that it is possible to make the number of

flexibly supported strips equal to or greater by one than the number of rigidly supported strips. Thus, while two flexibly supported strips are required, only one rigidly supported strip is required. In view of the foregoing, it is believed that the rejection under 35 U.S.C. §112, first paragraph has been overcome and it is respectfully requested that this rejection be withdrawn.

Claims 13-16 and 28-30 stand rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative, under 35 U.S.C. §103 as being obvious over German DE 3138133 ("DE '133"). Applicants respectfully traverse such rejection.

Claim 13, as amended, is now positively directed to a twin-wire former which includes a head box having an outlet placed and directed for delivering fiber suspension to the wedge shaped entrance slot of a first section of a twin wire zone of the former and positively recites that neither wire belt defines a single wire for pre-drainage zone.

In contrast, DE '133 includes, as noted on page 5, line 27 of applicants' specification, and as recognized by the Examiner, a single wire pre-drainage zone position in front of the twin-wire zone. As a result of the pre-drainage zone, forming of the web starts initially only in the lower layer of the fiber suspension while the upper layer remains liquid with the strong tendency to flocculation, and the resultant flakes cannot be broken up again to the desired extent in the following twin-wire zone.

While the Examiner recognizes that DE '133 has a single wire predrainage zone, the Examiner contends that the elimination thereof in DE '133 would be obvious. However, no support is offered for such assertion and applicants assert that such is not the case. Accordingly, it is respectfully submitted that DE '133 neither discloses nor suggests the twin-wire former set forth in claim 13 and that claim 13 is therefore patentable over DE '133.

Claims 14-16 and 28-30 are dependent either directly or indirectly from claim 13 and are therefore similarly patentable. In addition, these claims recite features such as the thickness

and spacing of the drainage strips, which are neither disclosed nor suggested by DE '133. In view of the foregoing, it is respectfully requested that the rejection of claims 13-16 and 28-30 on the basis of DE '133 be withdrawn.

Claims 13-16, 18-21 and 23-33 stand rejected under 35 U.S.C. §103 as being unpatentable over Tissari (U.S. Patent No. 4,609,435) or Koski (U.S. Patent No. 4,925,531) in view of DE '133. Applicants respectfully traverse such rejections.

As noted by the Examiner, both Tissari and Koski are each deficient in not disclosing resilient support. Thus, in Tissari, neither the strips 45 or 44 are resiliently supported and in the case of Koski neither of the deflectors 17 or 37 are resiliently supported.

The Examiner alleges that the artisan is well aware of the option and advantages of resiliently supporting the watering ribs/strips as evidenced by DE '133. However, as noted on page 4, line 18, et seq., of applicants' specification, applicants are not claiming that any of the specific features are new. What applicants are claiming however is that they are the first to have combined these features as specified in claim 1 and that such combination provides unforeseeable improvements in the resultant product, to wit, the combination of claim 1 results in extremely high increase in the quality of the finished fiber web while at the same time being insensitive to changes in the amount of suspension fed and to changes in the drainage behavior of the fiber suspension. Thus it is possible to obtain both a high increase in quality with respect to the formation and also good values with regard to the retention of fillers and fines. In contrast, in the twin-wire formers of the prior art, it is found that there is a strong reduction in the retention of fillers and fines. Neither Tissari nor Koski disclose or suggest that the dewatering ribs/strips employed therein should have one set which is resiliently mounted and the other set rigidly mounted. In view of the foregoing, applicants respectfully submit that claim 13 is patentable over Tissari, Koski and DE '133, either considered singly or in combination.

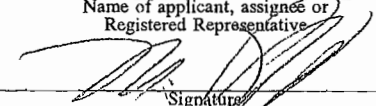
Claims 14-16, 18-21 and 23-33 are dependent either directly or indirectly from claim 13 and are therefore believed similarly allowable. In addition, these claims define additional features of the invention not disclosed or suggested in the reference, and in particular none of the references disclose the thickness and spacing of the drainage strips as claimed in claim 16.

With respect to the citation by the Examiner of Schiel, et al. (U.S. Patent No. 5,078,835), applicants respectfully point out that Schiel's effective date of reference is its U.S. filing date of June 6, 1991. Applicants' priority date, however, is August 22, 1989 and accordingly Schiel et al. is not prior art against this application.


With respect to the rejection of claim 22 as being unpatentable over DE '133, and further in view of Armstrong et al. (U.S. Patent No. 4,425,187), claim 22 has been cancelled and so this rejection is deemed moot. Applicant also wishes to point out that there is only one headbox employed in applicants' twin-wire former.

In view of the foregoing, this application is now believed to be in condition for allowance, which action is respectfully requested.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on November 19, 1992:

Martin Pfeffer  
Name of applicant, assignee or  
Registered Representative  
  
Signature  
November 19, 1992  
Date of Signature

Respectfully submitted,

  
Martin Pfeffer  
Registration No.: 20,808  
OSTROLENK, FABER, GERB & SOFFEN  
1180 Avenue of the Americas  
New York, New York 10036-8403  
Telephone: (212) 382-0700

MP:rdj:ss

# **EXHIBIT P**





UNITED STATES DEPARTMENT OF COMMERCE  
 Patent and Trademark Office  
 Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
 Washington, D.C. 20231

|               |             |                               |                     |
|---------------|-------------|-------------------------------|---------------------|
| SERIAL NUMBER | FILING DATE | EGELHOF FIRST NAMED APPLICANT | ATTORNEY DOCKET NO. |
|---------------|-------------|-------------------------------|---------------------|

OSTROLENK, FABER, GERB & SOFFEN  
 1180 AVENUE OF THE AMERICAS  
 NEW YORK, NY 10036-8403

13M1/0425

|              |
|--------------|
| EXAMINER     |
| HASTINGS, R. |

|           |              |
|-----------|--------------|
| ART. UNIT | PAPER NUMBER |
|-----------|--------------|

04/25/97

DATE MAILED:

### NOTICE OF ALLOWABILITY

#### PART I.

1. ☒ This communication is responsive to Amend B + Terminal Disclaimer.
2. ☒ All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
3. ☒ The allowed claims are 5, 6, 29, 30, 32 (renumbered 1-5).
4. ☐ The drawings filed on \_\_\_\_\_ are acceptable.
5. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received. ☐ not been received. ☐ been filed in parent application Serial No. \_\_\_\_\_, filed on \_\_\_\_\_.
6. ☒ Note the attached Examiner's Amendment.
7. ☒ Note the attached Examiner Interview Summary Record, PTOL-413.
8. ☐ Note the attached Examiner's Statement of Reasons for Allowance.
9. ☐ Note the attached NOTICE OF REFERENCES CITED, PTO-892.
10. ☐ Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

#### PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

1. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152; which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
2. ☐ APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
  - a. ☐ Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. \_\_\_\_\_. CORRECTION IS REQUIRED.
  - b. ☐ The proposed drawing correction filed on \_\_\_\_\_ has been approved by the examiner. CORRECTION IS REQUIRED.
  - c. ☐ Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
  - d. ☐ Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

#### Attachments:

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Examiner's Amendment                        | <input type="checkbox"/> Notice of Informal Application, PTO-152. |
| <input checked="" type="checkbox"/> Examiner Interview Summary Record, PTOL-413 | <input type="checkbox"/> Notice re Patent Drawings, PTO-948       |
| <input type="checkbox"/> Reasons for Allowance                                  | <input type="checkbox"/> Listing of Bonded Draftsmen              |
| <input type="checkbox"/> Notice of References Cited, PTO-892                    | <input type="checkbox"/> Other                                    |
| <input type="checkbox"/> Information Disclosure Citation, PTO-1449              |   |

Serial Number: 08/556,769

Page 2

Art Unit:

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Pfeffer on 4-23-97.

2. The application has been amended as follows:

Claim 33 has been canceled.

C! Claim 32, line 11 --single-- has been inserted before "first", and on the penultimate line after "zone" <sup>4</sup>, apart from said first drainage element which is a single forming roll, <sup>4</sup> has been inserted, and "guide" has been deleted, and last line "and which... effect" has been deleted.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Exr Hastings whose telephone number is (703) 308-0470.

kmh

April 24, 1997

*Karen M. Hastings*  
KAREN M. HASTINGS  
PRIMARY EXAMINER  
ART UNIT 133

4-24-97

**CERTIFICATE OF SERVICE**

I, Patricia P. McGonigle, Esquire, hereby certify that on this 16<sup>th</sup> day of January 2008, I electronically filed the foregoing pleading with the Clerk of Court using CM/ECF which will send notification of such filing to counsel of record. Further, I caused a copy of the foregoing pleading to be served upon the following counsel as noted

**Via Hand Delivery**

Adam W. Poff, Esquire  
Young, Conaway, Stargatt & Taylor, LLP  
1000 West Street, 17<sup>th</sup> Floor  
P. O. Box 391  
Wilmington, DE 19899

**Via Email**

Neil F. Greenblum, Esquire  
Neal Goldberg, Esquire  
Michael J. Fink, Esquire  
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1950 Roland Clarke Place  
Reston, Virginia 20191

*/s/ Patricia P. McGonigle*

---

Patricia P. McGonigle (ID No. 3126)  
[pmcgonigle@svglaw.com](mailto:pmcgonigle@svglaw.com)